





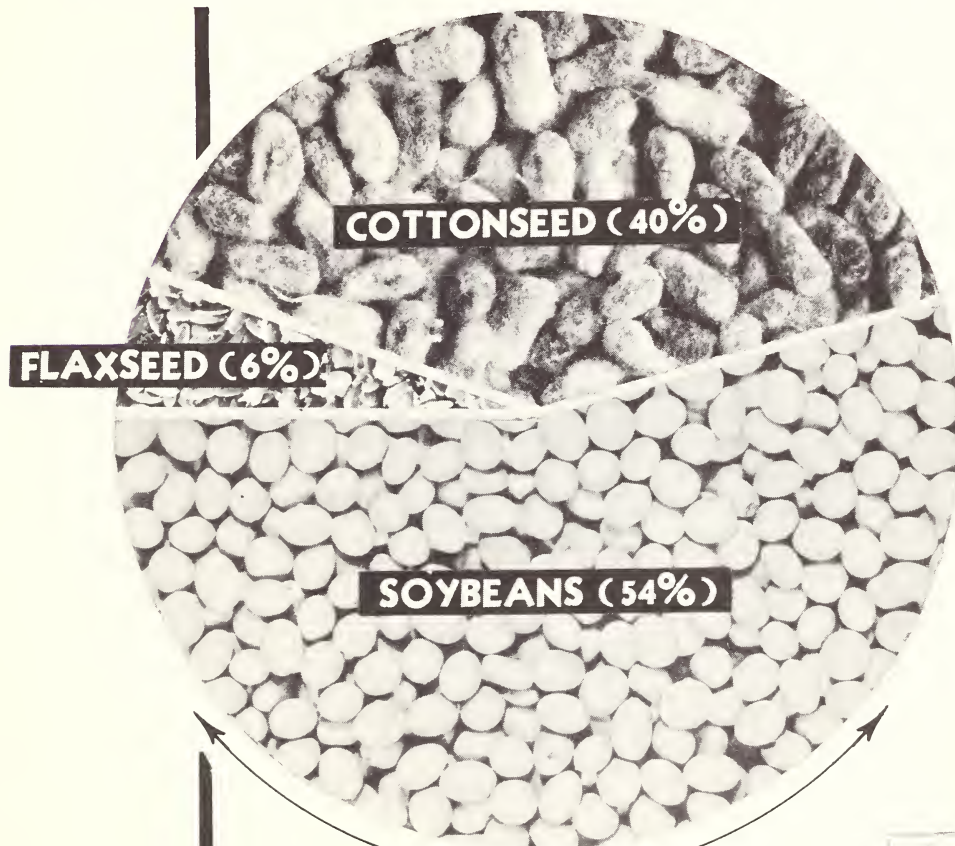
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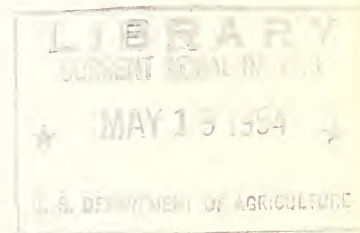
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# PROCESSING the THREE MAJOR OILSEEDS



Total quantity processed 1951-52

U.S. DEPARTMENT OF AGRICULTURE  
Agricultural Marketing Service  
Washington, D.C.





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## PREFACE

In December 1952, the Bureau of the Census, at the request of the U. S. Department of Agriculture, made a special survey of soybean, cottonseed, and flaxseed processors in the United States. These processors were asked to report the quantities of soybeans, cottonseed, and flaxseed crushed and the crude oil produced by type of equipment used during the 1951-52 season.

This report is based primarily on the basic data collected in that survey and data from secondary sources. Early in May 1953, United States summary data were released to the public. The primary purpose of the present report is to increase the usefulness of these data to the industry by an analysis by States. It is the first time that such information ever has been made available. The report briefly analyzes the trend in soybean processing techniques, estimates soybean crushing capacity and utilization, and presents the distribution and number of soybean, cottonseed, and flaxseed mills by method of extraction.

Acknowledgment is due Donald Jackson, Agricultural Economist, AMS, for his assistance in the analysis and writing of the report. Appreciation is also expressed to J. J. Gottsegen and C. V. Danielson of the Industry Division, Bureau of the Census, for their cooperation in making available the census data upon which the major phases of the report are based. These data are presented in such form as not to disclose the operations of individual processors.

The study on which this report is based was conducted under authority of the Agricultural Marketing Act of 1946 (RMA, Title II).

## SUMMARY

In terms of the amount of oil represented, soybeans rank as the first oilseed in the United States; cottonseed is a close second. Of the 282 million bushels of soybeans produced in 1951, 243 million bushels were processed for oil and meal, yielding 2.4 billion pounds of oil and 5.7 million tons of meal. The cottonseed crop of 1951 yielded 1.7 billion pounds of oil and 2.5 million tons of meal. Flaxseed, a much smaller crop in absolute terms, is by far our most important source of drying oil. The 1951 crop yielded 602 million pounds of linseed oil and 546 thousand tons of meal.

Soybeans are processed primarily by the direct-solvent method, which accounted for 74 percent of the 1951-52 crush. Twenty-five percent were processed by the screw-press method, and about 1 percent by the hydraulic-press method.

Of the 193 active crushers of soybeans, 70 were using solvent-extraction, 92 were using screw-presses, and 31 hydraulic-presses. More than half of the solvent extraction mills and almost half of all the mills were located in the four major soybean States--Illinois, Iowa, Ohio, and Indiana. The 39 solvent-extraction mills in those States represented only 20 percent of the number of soybean processors in the United States but handled more than 60 percent of the volume. One hundred twenty-eight mills processed soybeans exclusively, the remaining 65 mills being primarily cottonseed oil mills crushing soybeans after their supply of cottonseed had been exhausted.

During 1951-52, soybean oil yield averaged 10 pounds per bushel of beans. It was 10.52 pounds for solvent-extraction, 8.57 pounds for screw-presses, and 8.39 pounds for hydraulic-presses.

The annual processing capacity of the industry was estimated to be 310 million bushels. Eighty-six percent, or 266 million bushels, of this capacity was located in eight North Central soybean States. Most of the remainder was in the Cotton Belt. Illinois alone had an estimated capacity of 128 million bushels, or 41 percent of the Nation's capacity. Of the estimated 1951-52 capacity, 78 percent was utilized. This left 67-million-bushel unused capacity, of which 56 million was located in the 8 North Central States. Illinois alone had a 32-million-bushel excess, or approximately one-half of the total in the United States.

During 1951-52, there were 328 active cottonseed oil mills in the United States, 132 in the Southwest, 106 in the Southeast, 89 in the lower Mississippi Valley and 1 in Illinois. Their distribution by type of process was: 240 hydraulic, 75 screw-press, and 13 direct-and prepress-solvent.

Approximately 5.4 million tons of cottonseed were processed during the season, 57 percent by the hydraulic-press, 31 percent by the screw-press, and 12 percent by solvent extraction. In the Southeast and Valley the hydraulic was the most important processing method, accounting for 90 percent and 75 percent, respectively, of total volume. In the Southwest the screw-press method was the most important, accounting for 55 percent of the total for the area.

The average oil recovery per ton of cottonseed was 320 pounds. The Southeast recovered an average of 304 pounds, as compared with 320 pounds in the Valley and 326 pounds in the Southwest. Recovery varied considerably between States and mills within a given method of extraction, but the variation between methods was even greater.

The average oil recovery by the different methods was: Prepress-solvent, 368 pounds, direct-solvent, 348 pounds, screw-press, 329 pounds, and hydraulic-press, 307 pounds.

Flaxseed was processed by 23 mills during 1951-52. Some of these mills crushed flaxseed exclusively, whereas others crushed only small quantities of flaxseed in addition to other oilseeds.

Almost half of the linseed oil mills were in Minnesota and California. The others were widely scattered in 10 States. Seventeen of the mills used the screw-press method. Five used the direct-solvent and prepress-solvent extraction processes.

Of the 30 million bushels of flaxseed processed, the screw-press method accounted for about 16 million bushels as compared with 9 million processed by the prepress-solvent method. The remainder was processed primarily by the direct-solvent method.

Average oil outturn per bushel of flaxseed was 20.3 pounds. Oil outturn by the prepress-solvent method was 20.9 pounds in comparison with 19.9 pounds by the screw-press method.

# PROCESSING THE THREE MAJOR OILSEEDS

By George W. Kromer, agricultural economist,  
and  
C. B. Gilliland, marketing research specialist

## INTRODUCTION

The vegetable oil millers are only one group in a series of processors along the marketing channels for oilseeds and oilseed products. It is with this group, however, that the seeds are broken down into the various products which go into widely scattered markets and diversified uses. The mill starts operating as soon after harvest as there is sufficient raw material on hand to insure continuous operation. It operates as long a season as possible, the limiting factor usually being the ability to obtain the necessary supply of raw materials.

Obtaining the maximum amount of oilseeds for processing is a basic problem for most vegetable oil mills, because of the fact that they have excess crushing capacity. Each processor strives to utilize as much of his crushing capacity as possible in order to cut his costs per unit to a minimum. This results in narrow processing margins. In recent years processors have bid up prices for raw materials even in the face of the relatively lower product values resulting from the saturation of the domestic market for fats and oils. Because the supply of oilseeds is the result of crop factors beyond the processor's control, the keenness of competition between mills for the existing seed supply varies widely from year to year.

The physical efficiency of the oilseed mills is measured in this report by the oil outturn per unit of seed processed. The oil is the most valuable product per pound recovered from the processing of oilseeds.

All three of the oilseeds--soybeans, cottonseed, and flaxseed--are important to the Nation's economy, but data of the type required are far more restricted for cottonseed and flaxseed. Therefore, soybeans are treated more fully in this report. Figure 1 shows the percentages of quantities processed by method of extraction for each of the three major oilseeds in the 1951-52 season.

## SOYBEANS

The soybean is the largest oil-bearing crop produced in the United States. From the time soybeans were introduced into this country the trend in production has been upward. In 1946, and from 1948 onward, annual production has exceeded 200 million bushels. After the record crop of 300 million bushels in 1950, production dipped to 282 million bushels in 1951 and then increased to 298 million bushels in 1952. The anticipated crop for 1953 is 262 million bushels, according to the December crop report.

Despite the sharp upward trend in soybean production and the fact that some processors have discontinued operations, there is still an excess of processing capacity. This excess processing capacity is the result of two factors--building of additional mills and the enlargement of some mills. The enlargement mainly accompanies the conversion of mills to more economical extraction methods in which larger mills have a relative advantage.

### Location of Soybean Oil Mills

The soybean oil mills are largely concentrated in the heart of the Soybean Belt. Other locational factors, of course, are railroad transportation facilities, in-transit privileges, and nearness to consuming centers.

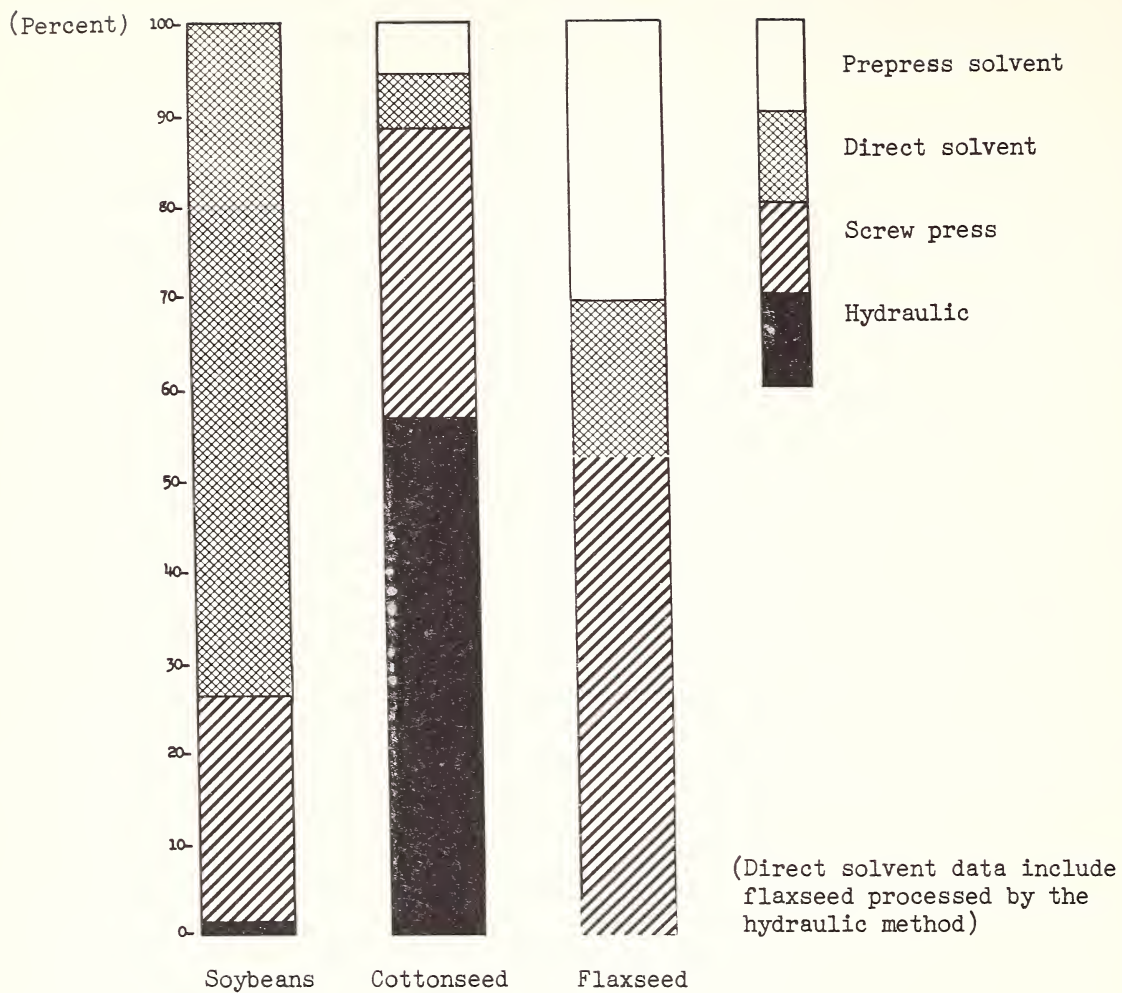


Figure 1.--Soybeans, cottonseed and flaxseed: Percentage distribution of processing by type of equipment, 1951-52

During the 1951-52 marketing season, 193 mills processed soybeans in the United States, and 128 of these processed soybeans exclusively. The remaining 65 mills were primarily cottonseed oil mills that crushed soybeans only after their supply of cottonseed had been exhausted. Seventy mills were using the direct-solvent extraction process, 92 mills the screw-press method, and 31 mills hydraulic presses (fig. 2). No prepress-solvent extraction mills were reported in the special survey.

Eighty-five mills, or almost one-half of the total, were in the four major soybean States--Illinois (31), Iowa (30), Ohio (14), and Indiana (10).<sup>1</sup> The mills processing soybeans only, as would be expected, were even more concentrated in these four States. Eighty of the mills in this area processed soybeans exclusively.

Solvent extraction mills operating in the 1951-52 season represented slightly more than one-third of all soybean oil mills in the United States. More than half of these mills were in the four major soybean States. The average volume of soybeans processed by these mills is shown in table 1.

TABLE 1.--Quantities of soybeans processed by solvent-extraction mills in the four major soybean States, 1951-52 season

State	Solvent ex- traction mills	Quantity processed	
		Total	Average per mill
	<i>Number</i>	<i>1,000 bushels</i>	<i>1,000 bushels</i>
Illinois.....	15	78,379	5,225
Iowa.....	13	28,110	2,162
Ohio.....	7	21,378	3,054
Indiana.....	4	19,629	4,907
Total.....	39	147,496	3,782

Illinois not only had the greatest number of solvent-extraction mills of any State but also the largest mills in terms of volume of soybeans processed. The 15 mills processed 78.4 million bushels, an average of 5.2 million bushels per mill. Indiana had the smallest number of solvent-extraction mills (4) among the four major States but ranked second in size of mill. Indiana's 4 mills processed approximately 19.6 million bushels, an average of 4.9 million bushels per mill. Ohio and Iowa ranked third and fourth, respectively, with regard to size of mill. Ohio's 7 solvent-extraction mills processed 21.4 million bushels, averaging 3.1 million bushels per mill, as compared with Iowa's 13 mills, that processed 28.1 million bushels, or an average of 2.2 million bushels per mill.

Perhaps the most notable information revealed by these data relates to the size of the solvent mills. The 39 solvent mills in the four major soybean States represented only 20 percent of the number of soybean processors in the United States, but accounted for slightly more than 60 percent of the soybeans processed during the season.

Screw-press mills operating during the 1951-52 season represented approximately one-half of all soybean mills in the United States. Sixty mills, or about two-thirds of all the screw-press mills, were located in the 8 Central soybean States. Most of the remaining 32 mills were scattered throughout the Cotton Belt.

Nearly one-half of the screw-press mills, like the solvent mills, were concentrated in the four major soybean States. Their number and the volume of soybeans they processed are given in table 2.

<sup>1</sup>Throughout the report reference is made to the four major States--Illinois, Iowa, Ohio and Indiana--because of the distinct differences in volume of soybeans processed. Reference is also made to the eight Central soybean States--Illinois, Iowa, Ohio, Indiana, Minnesota, Missouri, Kansas and Nebraska.

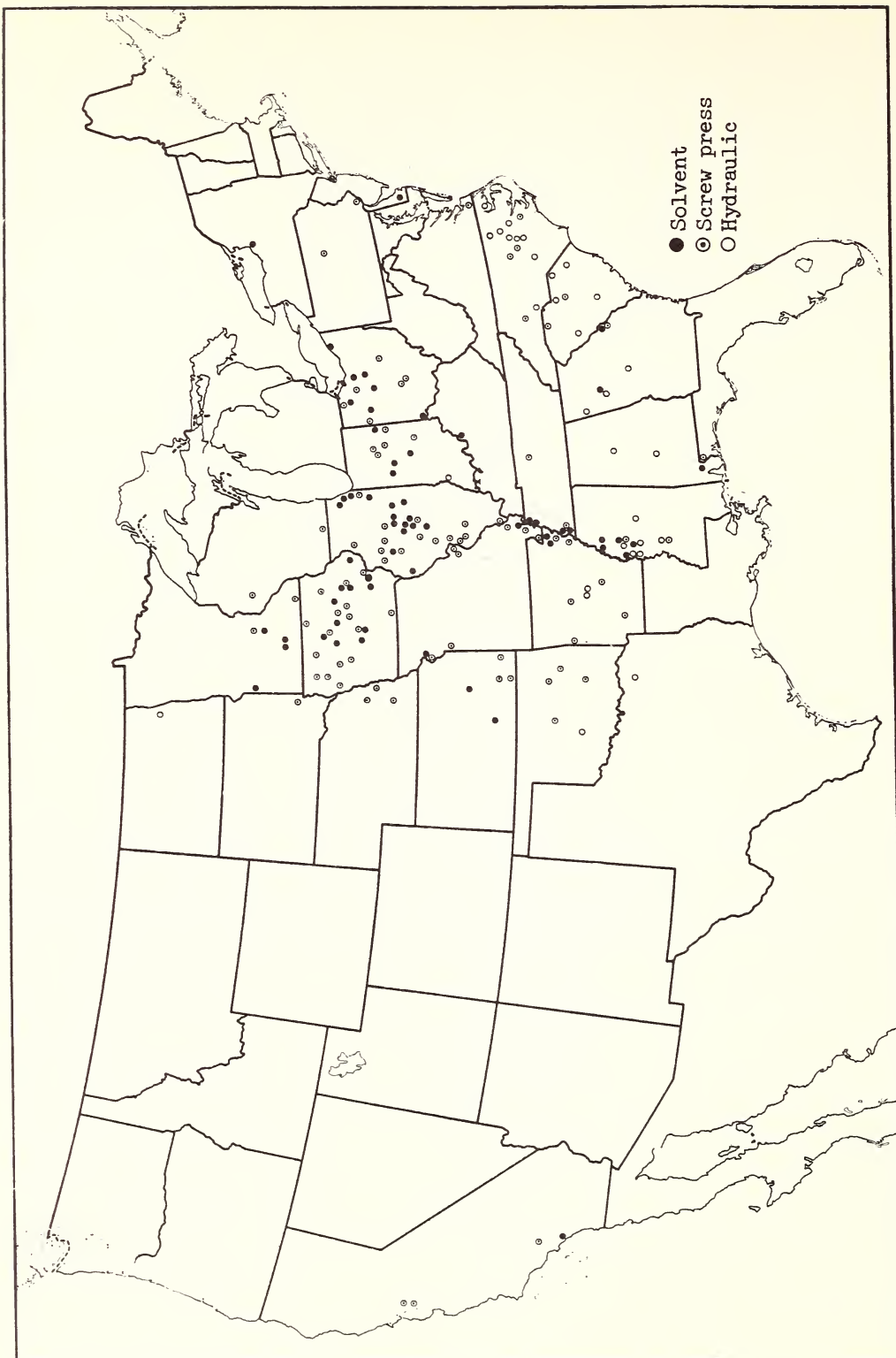


Figure 2.--Location of mills processing soybeans, by type of equipment, 1951-52

TABLE 2.--Quantity of soybeans processed by screw-press mills in the four major soybean States, 1951-52 season

State	Screw-press mills	Quantity processed	
		Total	Average per mill
	<i>Number</i>	<i>1,000 bushels</i>	<i>1,000 bushels</i>
Illinois.....	16	17,504	1,094
Iowa.....	17	10,332	608
Ohio.....	7	5,776	825
Indiana.....	5	( <sup>1</sup> )	( <sup>1</sup> )

<sup>1</sup> Not shown to avoid disclosure of individual processors' operations.

Illinois had 16 active screw-press mills crushing a total of 17.5 million bushels, or an average of about 1.1 million bushels per mill. Iowa had the largest number of mills (17) but the smallest volume of crush, the average crush per mill being 608 thousand bushels. Ohio's 7 screw-press mills crushed an average of 825 thousand bushels per mill.

In contrast to the solvent mills, the 45 screw-press mills located in the four major soybean States represented about 23 percent of the number of soybean processors in the United States but accounted for only 15 percent of the soybeans processed.

Hydraulic mills that crushed soybeans during the 1951-52 season were restricted to the Cotton Belt.<sup>2</sup> Most of them were cottonseed oil mills that crushed soybeans only after their supply of cottonseed had been exhausted. They played a relatively unimportant role in the processing of soybeans. There were 31 mills using this method, mostly in the Southeastern States. They represented about 16 percent of all soybean oil mills in the United States, but they accounted for only 1.4 percent of the total quantity of soybeans processed. North Carolina, with 9 hydraulic mills that crushed soybeans, was first in number, and Mississippi, with 6, was second.

### Trend in Processing Techniques

Today, solvent extraction is the principal method of processing soybeans in the United States (table 3).

Although the trend toward solvent extraction started more than 20 years ago, it was not until 1949-50 that it replaced the screw-press method as the leading process in the soybean industry. The proportion of soybeans processed by solvent extraction increased from 13 percent in 1936-37 to 40 percent in 1948-49, or a gain of 27 percentage points. Since 1948-49, the trend has been accelerated. By 1951-52 the proportion had increased to about 74 percent.

In the 3 crop years preceding World War II (1939-40 through 1941-42), approximately 74 percent of the soybeans were processed by the screw-press method. In the 3 years following the war (1946-47 through 1948-49) the proportion declined to about 58 percent. By 1949-50 it was less than 50 percent, and in 1951-52 it was 25 percent.

The hydraulic process was the first method used in the processing of soybeans. It was rapidly replaced by the more efficient screw-press method as the principal process soon after 1930.

During the period of transition to solvent extraction, increases were being made both in soybean production and in the proportion of the crop processed. From 1936-37 to 1951-52, production increased more than 700 percent. The proportion crushed increased from 61 to 89 percent. Obviously, the increase in the proportion crushed cannot go much further, for nearly 10 percent of the crop is needed for planting seed.

<sup>2</sup> Indiana crushed an insignificant quantity of soybeans by hydraulic press.

TABLE 3.--Quantity of soybeans processed, by method of extraction, United States, by crop years, 1936-37 through 1951-52

Crop year <sup>1</sup>	Soybeans processed by--							
	Hydraulic press		Screw press		Solvent extraction		Total	
	1,000 bushels	Percent	1,000 bushels	Percent	1,000 bushels	Percent	1,000 bushels	Percent
1936-37.....	3,804	18.4	14,092	68.4	2,720	13.2	20,616	100.0
1937-38.....	3,872	12.8	21,249	70.1	5,186	17.1	30,307	100.0
1938-39.....	5,269	11.8	32,236	72.2	7,138	16.0	44,643	100.0
1939-40.....	3,069	5.4	42,463	74.4	11,534	20.2	57,066	100.0
1940-41.....	1,749	2.7	47,512	74.2	14,788	23.1	64,049	100.0
1941-42.....	1,375	1.8	57,151	74.1	18,598	24.1	77,124	100.0
1942-43.....	27,290	20.5	84,359	63.2	21,791	16.3	133,440	100.0
1943-44.....	26,136	18.4	92,853	65.2	23,303	16.4	142,292	100.0
1944-45.....	14,576	9.5	108,182	70.5	30,629	20.0	153,387	100.0
1945-46.....	12,111	7.6	102,442	64.2	44,907	28.2	159,460	100.0
1946-47.....	16,271	9.5	108,744	63.9	45,224	26.6	170,239	100.0
1947-48.....	12,933	8.0	88,233	54.4	61,000	37.6	162,166	100.0
1948-49.....	9,351	5.1	101,535	55.3	72,773	39.6	183,659	100.0
1949-50.....	5,729	2.9	80,546	41.2	109,258	55.9	195,533	100.0
1950-51.....	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	251,862	100.0
1951-52.....	3,480	1.4	60,440	24.9	178,922	73.7	<sup>3</sup> 242,842	100.0

<sup>1</sup> October 1 through September 30.

<sup>2</sup> Data for crop year 1950-51 not available.

<sup>3</sup> The insignificant difference between this figure and the corresponding figures in tables 8 and 9 is due to different procedures in collection and utilization of data.

Source: Statistics prior to 1945-46 are estimates based upon data compiled by Bureau of the Census in cooperation with Northern Regional Research Laboratory, ARA, and F&O Br., PMA, USDA. Subsequent years' data based on special surveys made by the Bureau of the Census for U. S. Dept of Agr.

As a result of the increased production and the greater proportion processed, the volume of soybeans processed during the period 1936-37 to 1951-52 increased from 21 million bushels to 243 million bushels. The large increase in the supply of soybeans outran processing capacity, and required new mills in some areas and enlargement or replacement of old mills in others. Most of the added capacity was of the more efficient solvent-extraction type.

### Soybeans Processed by Method of Extraction

Soybeans processed in the United States in 1951-52 amounted to 243 million bushels. About 179 million bushels were processed by the solvent-extraction method, about 60 million by screw presses, and less than 4 million by hydraulic presses (table 4). Table 5 shows the percentage of soybeans processed by each method of extraction in the 8 Central soybean States.

The 110 processors in the eight Central soybean States processed 210 million bushels, or about 86 percent of the total for the United States; and furthermore, they processed 66 percent of the United States total by the solvent-extraction method.

Indiana, Illinois, and Minnesota each processed more than 80 percent of their soybeans by solvent extraction. The three-State total by this method was equivalent to about 45 percent of the total processed in the United States by all methods (fig. 3).



TABLE 5.--Percentage of soybeans processed by method of extraction in the eight Central soybean States, 1951-52 season

State	Hydraulic press	Screw press	Solvent extraction	Total
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Illinois.....	--	18	82	100
Iowa.....	--	27	73	100
Ohio.....	--	21	79	100
Indiana.....	( <sup>1</sup> )	( <sup>1</sup> )	83	100
Minnesota.....	--	20	80	100
Missouri.....	--	61	39	100
Kansas.....	--	( <sup>1</sup> )	( <sup>1</sup> )	100
Nebraska.....	--	100	--	100

<sup>1</sup> Not shown to avoid disclosure of individual processors' operations.

All of the soybeans processed in Nebraska and 61 percent of those in Missouri were processed by the screw-press method.

Most of the 14 percent of the country's total soybeans processed outside the Soybean Belt were processed by solvent extraction. Of the 33 million bushels crushed in "other States" more than 17 million bushels were processed by solvent extraction, more than 12 million bushels by screw press, and about 4 million bushels by hydraulic press.

Crude soybean oil production in the 1951-52 season amounted to 2.4 billion pounds, an average of 10 pounds per bushel of soybeans processed. For the most part, crude oil production followed the same pattern of distribution among the States as the quantity of soybeans processed, the main difference arising from variations in oil outturn obtained by the various types of extraction processes.

For the Nation as a whole, the solvent-extraction method accounted for about 74 percent of the quantity of soybeans processed, whereas it yielded almost 78 percent of the crude soybean oil. Twenty-five percent of the soybeans were processed by the screw-press method and they produced 21 percent of the crude oil. Hydraulic presses accounted for 1.4 percent of the quantity of soybeans processed and for 1.2 percent of the crude soybean oil produced.

Crude oil outturn per bushel of soybeans processed by the three extraction methods during the 1951-52 season averaged as follows:

<u>Method</u>	<u>Pounds</u>
All methods.....	10.00
Solvent extraction.....	10.52
Screw press.....	8.57
Hydraulic press.....	8.39

The average yield of crude oil by solvent extraction for every State was considerably above the highest State average for any other method.

Kentucky led in oil outturn with 10.78 pounds of oil per bushel of soybeans, all processed by solvent extraction. Illinois, the leading State in crude soybean oil production, ranked second in oil outturn per bushel by solvent extraction and first in outturn by the screw-press method.

The eight Central soybean States averaged 10.09 pounds of oil per bushel of soybeans processed, as compared with 9.46 pounds in other States. The differential in yields between these two areas arises mainly from the lower yields of the screw presses and hydraulic presses, located mostly in the cotton States. The yield by solvent extraction averaged the same for both areas, 10.50 pounds per bushel.

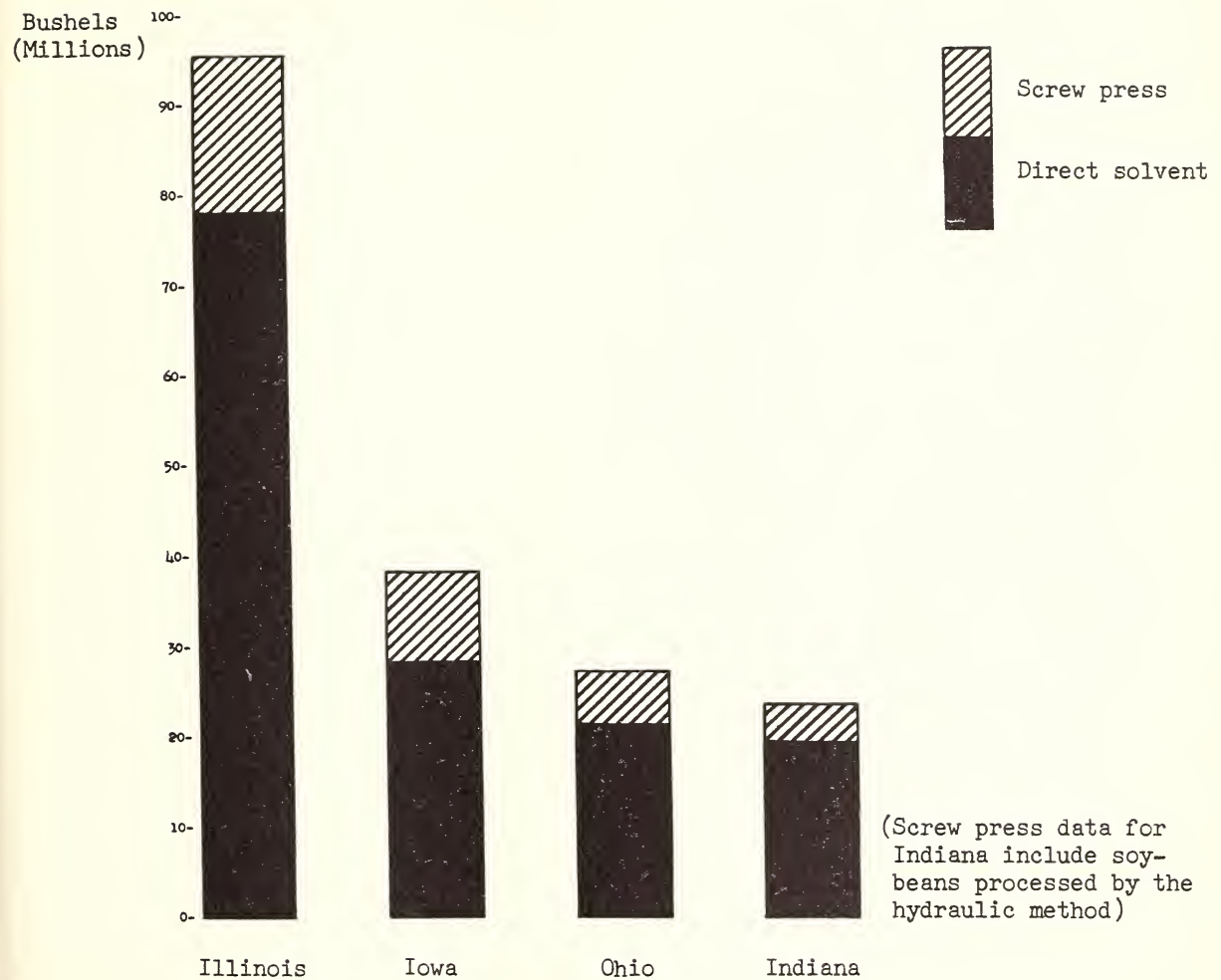


Figure 3.--Quantities of soybeans processed, by type of equipment, in the four major soybeans States, 1951-52

Table 6 shows for each method of extraction the highest and lowest State average in oil yields per bushel of soybeans processed and the range of differences between high and low. The yields for all methods combined varied from a low of 7.56 pounds in South Carolina to a high of 10.78 in Kentucky, or a range of slightly more than 3 pounds. The greatest contributing factor to this variation is the difference in processing techniques.

TABLE 6.--Range between State averages of oil outturn per bushel of soybeans processed, by method of extraction, 1951-52 season

Method of extraction	Highest		Lowest		Range
	<i>Pounds</i>	<i>State</i>	<i>Pounds</i>	<i>State</i>	<i>Pounds</i>
All types <sup>1</sup> .....	10.78	Kentucky	7.56	South Carolina	3.22
Solvent extraction.....	10.78	Kentucky	9.30	Minnesota	1.48
Screw press <sup>1</sup> .....	9.06	Illinois	7.13	Minnesota	1.93
Hydraulic press.....	8.52	Arkansas	7.80	South Carolina	.72

<sup>1</sup> Variation due primarily to different methods of extraction. Screw-press mills in South Carolina reported lower oil outturns than hydraulic mills.

The range of variation between State averages in oil outturn for any given method of extraction was found to be smaller than between the industrywide averages of different processes. The most important factor contributing to the variation within a particular method of extraction is the oil content of the soybeans.

The range between State average oil outturns very nearly represents also the range between methods of processing, because the processes are weighted differently in the various States. The greatest difference in average outturn between States is that between Kentucky and South Carolina. This difference is due primarily to differences in processing methods.

The range of variation of production between the States, within a given process, was greatest for the screw-press mills. Illinois screw-press mills recovered 9.06 pounds per bushel of soybeans crushed, compared with 7.13 pounds for mills in Minnesota, or an average difference of nearly 2 pounds. The range in oil recovery between States for the solvent mills was approximately  $1\frac{1}{2}$  pounds and for hydraulic mills about  $\frac{3}{4}$  of a pound.

### Soybean Industry Crushing Capacity

The estimated crushing capacity of the domestic soybean industry in 1951-52 was 30 million bushels per month. The summation of the "peak" month crushes for individual mills was assumed to represent capacity. If it is assumed that the mills in the 8 Central soybean States had a sufficient supply of soybeans and could continue their peak-month rate for 11 months, and if the soybean processors in the Cotton Belt could similarly operate their mills for as many as 6 months, the annual crushing capacity of the domestic soybean industry would be about 310 million bushels (table 7).<sup>3</sup>

Solvent-extraction mills should average about 330 processing days per year, and there appears to be no reason why screw-press mills should be unable to operate for as long a season. In view of the fact that about 75 percent of the soybeans are processed by solvent-extraction mills, which usually operate for a longer season than other mills, it appears reasonable to assume an 11-month processing season in estimating the capacity of mills in the Central soybean States.

<sup>3</sup> Capacity is estimated here on the assumption that average length of soybean-processing season is the same (11 months) for all mills in the 8 principal soybean States, and is the same (6 months) in all other States. Although that assumption undoubtedly is somewhat in error, the error cannot be so great as to destroy the usefulness of the comparison of percentages of capacity utilized as shown in the last column of table 7, and discussed on page 12.

TABLE 7.--Estimated crushing capacity of soybean oil mills, United States, by States, 1951-52 season<sup>1</sup>

State	Crushing capacity						
	Mills		Total <sup>2</sup>		Utilized		Ratio of utilized to total
	Number	Percent	1,000 bushels	Percent	1,000 bushels	Excess	
United States.....	193	100	310,498	100	3242,842	1,000 bushels 67,656	Percent 100
Central soybean producing States:							
Illinois.....	31	16	127,518	41	95,883	31,635	Percent 47
Iowa.....	30	15	49,710	16	38,442	11,268	Percent 17
Ohio.....	14	7	29,835	10	27,153	2,682	Percent 4
Indiana.....	10	5	25,282	8	23,679	1,603	Percent 2
Minnesota.....	7	4	11,979	4	10,325	1,654	Percent 3
Missouri.....	9	5	11,530	4	7,912	3,618	Percent 5
Kansas.....	6	3	8,126	2	4,766	3,360	Percent 5
Nebraska.....	3	2	1,991	1	1,822	169	Percent --
Total.....	110	57	265,971	86	209,982	55,989	Percent 83
Other soybean producing States:							
Kentucky.....	4	2	8,217	3	6,347	1,870	Percent 3
Arkansas.....	10	5	46,137	2	5,517	620	Percent --
Tennessee.....	6	3	45,653	2	5,366	287	Percent --
Mississippi.....	13	7	44,824	1	2,719	2,105	Percent 3
North Carolina.....	13	7	42,497	1	2,280	217	Percent --
California.....	4	2	42,269	1	1,575	694	Percent 1
Oklahoma.....	5	2	41,270	--	821	449	Percent --
Georgia.....	6	3	41,950	--	730	1,220	Percent 2
South Carolina.....	7	4	41,052	--	497	555	Percent --
All other.....	15	8	10,658	3	7,008	3,650	Percent 5
Total.....	83	43	44,527	14	32,860	11,667	Percent 17

<sup>1</sup> October 1, 1951 through July 31, 1952.

<sup>2</sup> Based on 11-month crushing season.

<sup>3</sup> The insignificant difference between this figure and the corresponding figures in tables 8 and 9 is due to different procedures in collection and utilization of data.

<sup>4</sup> Cotton Belt States crushing capacity estimated on a 6-month basis in order to allow for crushing of other oilseeds.

Source: Compiled from Bureau of the Census reports.

Eighty-six percent, or 266 million bushels, of the assumed 310-million-bushel soybean-crushing capacity in the United States, as estimated here, was located in the 8 Central soybean States. Most of the remaining 14 percent of capacity was scattered through the Cotton-Belt States. Four States--Illinois, Iowa, Ohio, and Indiana--had 75 percent of the industry's capacity, and Illinois alone, the leading State in soybean production, had an estimated capacity of 128 million bushels, or 41 percent of the Nation's total.

The utilization of soybean crushing capacity, as measured by the industry's crush, averaged 78 percent during the 1951-52 season (table 7). This means that the industry was equipped to process the 1951-52 volume of soybeans in 257 days.

The utilization of processing capacity, according to the estimates, averaged 79 percent in the Central soybean States and 74 percent in the Cotton Belt. In the four major States, capacity was 80 percent utilized--Indiana utilizing 94 percent of its capacity, and Illinois ranking fourth with 75 percent utilization. In the four remaining Central soybean States--Minnesota, Missouri, Kansas, and Nebraska--Nebraska led with 91 percent capacity utilization, compared with only 59 percent in Kansas.

Of the mills crushing soybeans in the Cotton Belt, Tennessee mills crushed a volume equal to 95 percent of their estimated capacity, whereas Georgia mills utilized only 37 percent of their capacity.

By excess crushing capacity, as used here, is meant the difference between the estimated capacity and the quantity of soybeans actually crushed. For instance, during the 1951-52 processing season, the estimated crushing capacity of the domestic soybean industry was 310 million bushels of soybeans. Since only 243 million bushels actually were crushed, the indicated excess crushing capacity was 67 million bushels, 56 million bushels of which was located in the 8 Central soybean States.

Illinois alone had an estimated 32-million-bushel excess, which represents about half of the total excess in the United States (fig. 4).

Whether or not excess capacity of the industry may be termed "over-expansion" may be a moot question. In no year is it feasible for every mill to achieve 100 percent utilization of its processing facilities. Despite the competitive drive of each processor to utilize as much of his crushing capacity as possible, average utilization for the industry obviously is determined by the size of the crop. Processors know that at any specific "profitable" price a certain quantity of beans has to be processed to meet overhead costs and earn an acceptable profit. With excess capacity, however, this obviously may not be possible for all mills.

For a great part of the 1951-52 season, soybean oil prices were relatively weak, and with a ceiling over meal prices, a decrease in processors' margins developed. The effect apparently was felt most by the mills whose operations were not integrated with the mixed feed business and other sideline activities. Some of those mills reported that they were unable to compete and were forced to shut down and remain dormant for the rest of the season. Nevertheless, during that season the industry showed the second largest crush on record.

### Soybean Oil Mill Operations

The supply of soybeans in the United States was 286 million bushels for the 1951-52 season. About 4 million bushels represented stocks carried over from the previous year and 282 million bushels were produced in 1951 (table 8).

The disappearance of this supply was as follows:

Disappearance	Million bushels	Percent
Used for seed	19	6.8
Net exports	17	6.0
Crushed	244	86.3
Feed and residual	3	.9
Total disappearance	283	100.0

For the 5 crops 1947 through 1951, 84 percent of the soybeans harvested for beans moved to the mills for processing into oil and meal. The percentage varied from 81 to 87 percent during the 5-year period, varying inversely with the size of the crop.

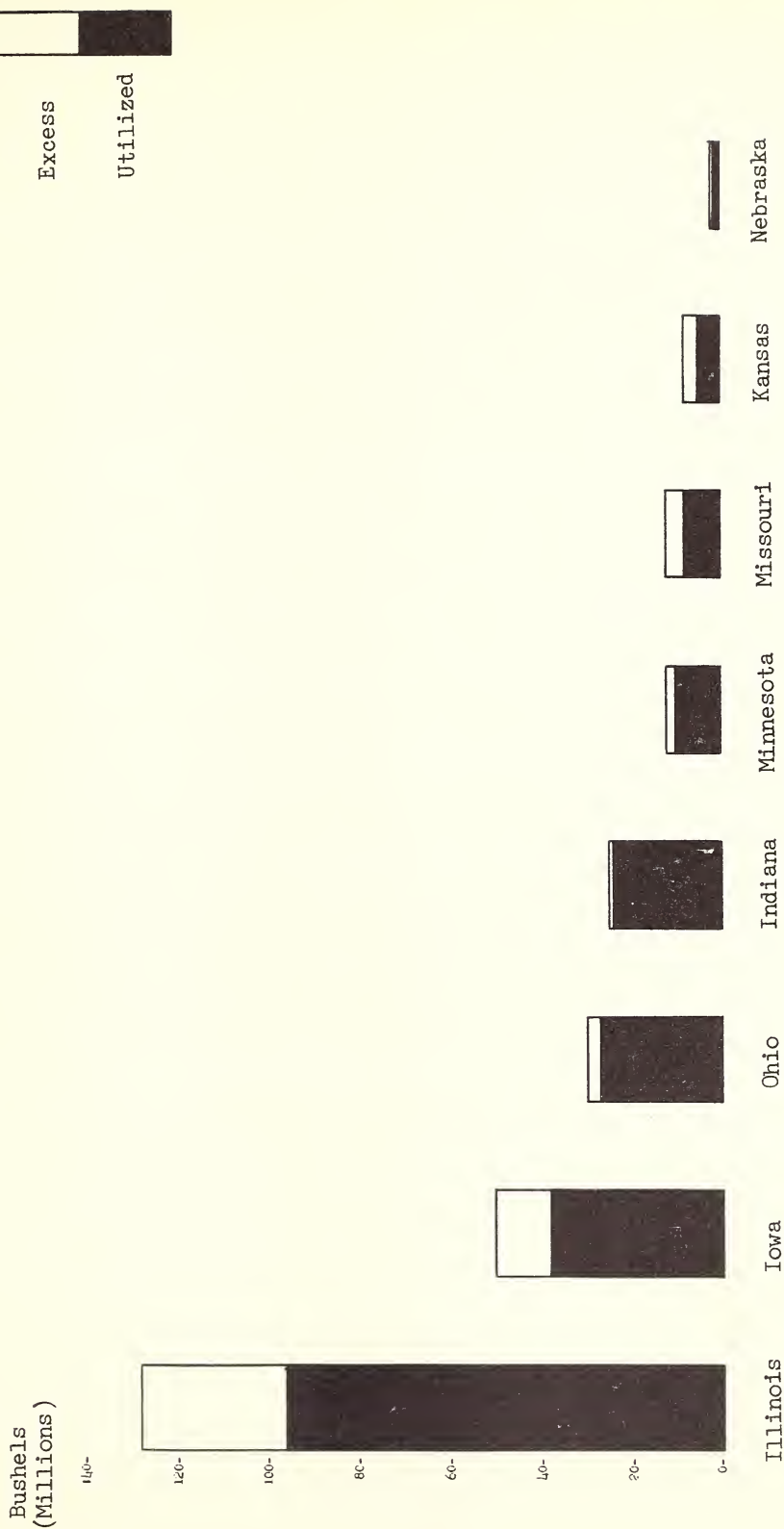


Figure 4.--Estimated soybean processing capacity and utilization in the eight Central soybean States, 1951-52

TABLE 8.--Supply and disappearance of soybeans, United States, by crop years, 1942-43 through 1953-54

Crop year	Supply			Disappearance									
	Stocks <sup>1</sup> (beginning of year)	Production	Total	Used for seed		Net exports <sup>2</sup>		Crushed		Feed and residual <sup>3</sup>		Total disappearance	
				1,000 bushels	Percent	1,000 bushels	Percent	1,000 bushels	Percent	1,000 bushels	Percent	1,000 bushels	Percent
1942-43.....	6,009	187,524	193,533	20,980	11.6	904	0.5	133,453	73.7	25,659	14.2	180,996	100.0
1943-44.....	12,537	190,133	202,670	19,758	10.5	934	.5	142,307	75.5	25,518	13.5	188,517	100.0
1944-45.....	14,153	192,121	206,274	18,885	9.5	5,029	2.5	153,402	77.3	21,219	10.7	198,535	100.0
1945-46.....	7,739	193,167	200,906	16,473	8.4	2,812	1.4	159,459	81.1	17,806	9.1	196,550	100.0
1946-47.....	4,356	203,395	207,751	17,137	8.5	3,842	1.9	170,245	84.1	11,134	5.5	202,358	100.0
1947-48.....	5,393	186,451	191,844	15,665	8.3	2,943	1.5	161,397	85.3	9,222	4.9	189,227	100.0
1948-49.....	2,617	227,217	229,834	15,381	6.8	23,004	10.2	183,664	81.0	4,604	2.0	226,653	100.0
1949-50.....	3,181	234,194	237,375	19,021	8.1	13,133	5.6	195,265	83.3	7,049	3.0	234,468	100.0
1950-51.....	2,907	299,279	302,186	18,225	6.1	27,826	9.3	251,990	84.6	- 14	---	298,027	100.0
1951-52.....	4,159	282,477	286,636	19,539	6.9	17,045	6.0	244,380	86.3	2,097	.8	283,061	100.0
1952-53.....	3,575	298,052	301,627	19,840	6.8	<sup>5</sup> 31,906	11.0	<sup>4</sup> 234,404	80.4	5,340	1.8	291,490	100.0
1953-54.....	10,137	6 262,341	272,478	---	---	---	---	---	---	---	---	---	---

<sup>1</sup> October 1 stocks include only old crop soybeans.<sup>2</sup> Imports negligible.<sup>3</sup> Mostly quantity fed, but includes waste, loss, and statistical errors in estimates.<sup>4</sup> The insignificant difference between this figure and the corresponding figures in tables 3, 4, and 7 is due to different procedures in collection and utilization of data.<sup>5</sup> Partly estimated<sup>6</sup> December 1953 crop report.

Stocks, production, and quantity used for seed estimated by Crop Reporting Board; exports and quantity crushed from Bureau of the Census.

Source: U. S. Dept. Agr.

Receipts of soybeans at the oil mills are heavy during the season when farmers harvest and market their beans. Only a small percentage of the beans, however, move directly from farmers to the processing plants.<sup>4</sup> Country elevators play an important role in the marketing channels. Most soybeans in the central belt move physically through the country elevator, although processors purchase a great part of them through interior carlot dealers and commission merchants. Small processors may be able to supply their needs from the local area, but most processors require buying organizations to obtain adequate soybeans to insure year-round operations. Some processors own or lease country elevators for the purpose of collecting and storing enough soybeans to keep their plants running throughout the processing season.

Every month of the year soybeans are received at some mills, but not all mills have year-round receipts. During the 1951-52 season, 125 million bushels of soybeans, or about one-half of the total processed, were received in the 3-month period, October through December. In most years, mill receipts pick up in September because harvesting begins then. When the bulk of the harvest has been completed, receipts drop off rapidly. The heavy movement in the intervening weeks creates a problem of storage and tends to increase price fluctuations.

In contrast to receipts, the processing of soybeans is relatively stable throughout the season. During 1951-52 the "big month" crush of 24 million bushels was in January. Thereafter the crush dwindled approximately 1 million bushels per month, giving a season's average of 20.4 million bushels a month, and a total of 244 millions.

Soybeans are harvested within a short period and they rapidly accumulate in marketing channels during harvesttime, because farmers sell a large proportion of them as soon as harvested. From the buyer's standpoint, early buying takes full advantage of seasonally depressed soybean prices.

Comparing soybeans with cottonseed, the oilseed of second importance, it becomes apparent that the greater seasonal uniformity in the processing of soybeans is possible only because mill receipts are less seasonal in the soybean industry than in the cottonseed industry. To a considerable extent, soybeans are stored on farms and in commercial storage houses along the marketing channels. These beans move on to the mills after the volume of mill storage has passed its peak. To move them all to the mills at harvesttime would require much more mill storage capacity than exists or a greatly expanded crushing capacity. This latter alternative, in turn, would necessitate a much more seasonal crush or a much shorter milling season.

In spite of the oilseed industry's excess crushing capacity, local shortages in processing and storage facilities have existed at times in some areas. These local needs have been such in some recent years that the Federal Government, under authority of the Defense Production Act, has granted accelerated tax amortization on approved new structures to alleviate local conditions. Processors attempting to acquire a large part of their soybeans during the harvest period frequently have found their limiting factor to be storage facilities. A few processors own or lease country elevators from which soybeans at harvest are moved to the mill as needed.

Soybeans are a commodity readily storable, and this is an economic advantage that they have over some other oilseeds, such as cottonseed. The bulk of the cottonseed is stored at processing plants, requiring special facilities, whereas soybeans can be stored in grain-storage facilities on the farm, or at country elevators, or at processing plants. Soybeans can be stored economically for a longer time, and this contributes to more orderly marketing of the commodity. Quality of stored soybeans probably is affected most by the single factor of moisture content and the consequent amount of mold, heating, and other spoilage. Other important factors contributing to deterioration are insects and rodents.

In practice, the cottonseed processor must purchase most of the season's supply within a relatively short ginning period, whereas the soybean processor frequently purchases beans throughout the processing season. Because of storage problems due to the physical properties of cottonseed, a large proportion of the seed must be processed early

<sup>4</sup>Sabin, A. R., Marketing Channels and Margins for Soybeans and Soybean Products in Illinois, 1947 and 1948. BAE, U. S. Dept. Agr. 1950.

in the season, which gives most crushers a relatively short operating season. Because soybeans are more readily storable, processors are able to operate 11 to 12 months a year at their optimum processing rate.

During the 1951-52 season, the peak month-end stock at the oil mills was 68 million bushels in November 1951, which was 3 times as many as were processed during that month. Thereafter for the rest of the processing season, soybeans crushed were in excess of soybeans received at mills, and the processors' stocks were dwindling.

Soybean products that the mills normally produce are crude oil and cake or meal. Pound for pound, the oil is the more valuable product.

The production of soybean oil and soybean meal necessarily follows the same seasonal distribution as crushings of soybeans. During the 1951-52 season, 5.7 million tons of soybean cake and meal were produced in the United States. The industry average outturn of meal per bushel of soybeans processed was 46.68 pounds (table 9). The lowest monthly outturn per bushel was 45.94 pounds in March as compared with a high of 47.71 pounds in August, a difference of 1.77 pounds per bushel.

According to data reported to the Bureau of the Census, oil outturn per bushel improved as the season progressed. The lowest monthly oil outturn per bushel, 9.55 pounds, was reported in December and the highest, 10.40 pounds, in September. Whether the apparently higher yields of oil toward the end of the season result from more efficient mill operation, a longer season for the more efficient mills, adjustment in inventories, or to some peculiarity in the way the records are developed cannot be ascertained from the available data.

As the 1951-52 season progressed, there was an increase in total recovery of soybean products per bushel of beans processed, as shown by the data available. Experienced processors have the ability to adjust their plants and equipment to their optimum operating capacity and thereby improve the overall efficiency of the mills. Another possible reason for increased yields could be improved conditions of the beans through storage. Although the oil content of the soybeans would remain the same, proper conditioning of the beans through storage might make them easier to process and thus improve product outturn.

## COTTONSEED

Historically, the cottonseed processing industry has been primarily a hydraulic-press industry. However, for a decade or more, the trend has been toward the more efficient methods of screw press and solvent extraction. In the 1951-52 season, the latter two methods accounted for more than 40 percent of the cottonseed processed.

In the last few years the so-called feeder-mill technique has been introduced and adopted by at least three oil-extraction mills. This technique involves the delinting and hulling of cottonseed by feeder mills and the solvent extraction of the oil from the cottonseed meats at a central mill. For an operator of a number of older type mills, it may be a feasible means of realizing economies of large-scale operation and a more efficient type of oil-extraction process. It appears to require less new capital investment than would the conversion of the several mills to one unified newer type mill. Further economies may accrue to the mill operator through the reduction of transportation costs. It costs less to ship the cottonseed meats than the bulky cottonseed to a large centrally located mill. Furthermore, the back haul on the cottonseed hulls is eliminated insofar as they are consumed in the area of cottonseed production.

The economies gained in transportation costs may tend to be offset by lower efficiency of labor and management at the feeder mills. To the extent that these factors cancel each other out, it appears that the net economy of the feeder mill technique is achieved through the reduction of the capital investment requirement.

A recent innovation in the processing of cottonseed has been developed by the Southern Regional Research Laboratory of the U. S. Department of Agriculture. It is called the filtration extraction system. It is a variation of the direct-solvent process, designed primarily for the smaller cottonseed crusher. The first commercial mill to utilize it was being converted to the new process in 1953 in Mississippi.

TABLE 9.--Soybean oil mill operations, by months, 1951-52 season

Month	Soybeans				Soybean products			
	Received	Crushed	Stocks (end of month)	Cake and meal		Crude oil		Total outturn per bushel
				Production	Stocks (end of month)	Production	Stocks (end of month)	
1951	Bushels	Bushels	Bushels	Tons	Tons	Pounds	1,000 pounds	Pounds
October.....	1 75,630,570	21,553,978	58,350,064	499,801	27,044	214,799	121,135	56.35
November.....	32,728,993	23,033,596	1 68,045,461	536,114	30,455	224,834	164,529	56.31
December.....	16,972,636	23,176,349	61,841,749	541,418	34,048	221,400	197,346	56.27
1952								
January.....	13,093,957	1 24,043,895	50,896,110	1 563,756	32,690	1 234,386	230,950	56.64
February.....	20,983,001	22,454,254	49,424,857	525,048	46,702	222,247	240,510	56.67
March.....	14,816,985	21,537,846	42,703,996	494,712	53,988	218,381	1 245,027	56.08
April.....	9,727,327	20,127,220	32,304,103	467,227	57,023	204,138	224,072	56.57
May.....	15,866,680	19,680,198	28,490,584	457,917	59,041	199,002	197,473	56.65
June.....	20,959,704	18,615,372	30,834,916	435,114	57,784	189,977	185,122	56.96
July.....	9,038,663	17,536,979	22,336,599	1 410,779	1 71,315	179,498	180,130	57.09
August.....	4,280,839	17,547,678	9,069,760	418,562	63,737	178,795	136,414	1 57.90
September.....	17,528,814	14,967,336	11,631,237	351,374	51,546	155,632	98,287	57.35
Season.....	251,628,169	2 244,274,701		5,701,822		2 2,443,089		56.68

1 Big month.

2 The insignificant difference between this figure and the corresponding figures in tables 3, 4 and 7 is due to different procedures in collection and utilization of data.

Source: Facts for Industry, Bureau of the Census.

## Location of Cottonseed Oil Mills

During the 1951-52 season, there were 328 active cottonseed oil mills in the United States. Of these mills, 132 were in the Southwest, 106 in the Southeast, and 89 in the Mississippi Valley (table 10).<sup>5</sup> Their distribution by type of process was as follows: 240, or approximately 75 percent, of the mills were of the hydraulic-press type; 75, or

<sup>5</sup> The Southeast includes Alabama, Georgia, North Carolina and South Carolina; The Mississippi Valley includes Arkansas, Louisiana, Mississippi and Tennessee; The Southwest includes Arizona, California, Oklahoma and Texas.

TABLE 10.--Number of cottonseed oil mills, by method of extraction, United States, by regions and States, 1951-52 season<sup>1</sup>

Region and State	Mills crushing cottonseed by--									
	Hydraulic press		Screw press		Direct-solvent extraction		Prepress-solvent extraction		Total	
	Number 240	Percent 100	Number 75	Percent 100	Number 6	Percent 100	Number 7	Percent 100	Number 328	Percent 100
United States...										
<u>Southeast:</u>										
Alabama.....	21	9	2	3	--	--	1	14	24	7
Florida.....	--	--	1	1	--	--	--	--	1	--
Georgia.....	29	12	1	1	1	17	--	--	31	10
North Carolina..	24	10	2	3	--	--	--	--	26	8
South Carolina	21	9	3	4	--	--	--	--	24	7
Total.....	95	40	9	12	1	17	1	14	106	32
<u>Valley:</u>										
Arkansas.....	14	6	3	4	1	17	2	29	20	6
Louisiana.....	14	6	1	1	--	--	--	--	15	4
Mississippi...	36	15	2	3	--	--	--	--	38	12
Missouri.....	2	1	1	1	--	--	--	--	3	1
Tennessee.....	8	3	4	6	1	17	--	--	13	4
Total.....	74	31	11	15	2	33	2	29	89	27
<u>Southwest:</u>										
Arizona.....	1	--	3	4	--	--	1	14	5	2
California....	--	--	10	14	--	--	1	14	11	3
New Mexico....	1	--	2	3	--	--	--	--	3	1
Oklahoma.....	8	3	7	9	--	--	--	--	15	5
Texas.....	61	25	32	42	3	50	2	29	98	29
Total.....	71	29	54	72	3	50	4	57	132	40
<u>Other:</u>										
Illinois.....	--	--	1	1	--	--	--	--	1	--

<sup>1</sup> August 1, 1951, through July 31, 1952. Mills discontinuing operations or dormant during the season not included. Mills using more than one type of extraction process classified according to their major type of process.

Source: Compiled from a special survey made by the Bureau of the Census in cooperation with the U. S. Dept. Agr.

about 20 percent, were of the screw-press type, and 13, or about 5 percent, were of the direct-solvent and prepress-solvent-extraction types.

In the Southeast, about 90 percent of the mills used hydraulic presses, as compared with 80 percent in the Valley and about 50 percent in the Southwest.

Screw-press mills were concentrated in the Southwest, where more than 70 percent of the mills of this type in the United States were located. The remaining 30 percent of the screw-press mills were divided fairly evenly between the Southeast and the Valley.

More than 50 percent of the solvent-extraction mills were located in the Southwest. The mills were divided almost evenly between the two solvent extraction processes--direct and prepress.

Among the individual States, Texas had the greatest number of processors by each method of extraction. Of the 98 mills crushing cottonseed in Texas during the 1951-52 season, 61 were using hydraulic presses, 32 using screw presses, 3 using direct-solvent-extraction, and 2 using prepress-solvent-extraction (fig. 5).

### Cottonseed Processed by Method of Extraction

Of the 5.4 million tons of cottonseed processed in the United States, during the 1951-52 season, about 57 percent, or 3.1 million tons, were processed by the hydraulic mills; 31 percent, or 1.7 million tons, by the screw-press mills, and equal amounts of 6 percent each, or 0.3 million tons, by the direct-solvent-extraction and the prepress-solvent-extraction mills (table 11).

Both in the Southeast and in the Valley, the hydraulic mills processed the greater part of the cottonseed. Of the 1.2 million tons processed in the Southeast, 90 percent, or 1.1 million tons, were processed by hydraulic mills. In the Valley the corresponding percentage was 75. In the Southwest, however, the screw-press method was the most important process, accounting for about 55 percent of the cottonseed crushed there.

Table 11 shows the oil outturn per ton of cottonseed processed for the 1951-52 crop on an individual State basis, by method of extraction. The average outturn was 320 pounds. The Southeastern States recovered on an average 304 pounds, compared with 320 pounds in the Valley and 326 in the Southwest. The low yield of oil in the Southeast is probably due primarily to the lower quality of the cottonseed and to the fact that about 90 percent of the cottonseed was crushed by hydraulic presses.

Average oil outturn for any one type of mill varies between States, but it varies less than the industrywide averages vary between types of mills for the United States (or for some individual States). For example, during the 1951-52 season, the range between State average oil yields for all methods was 44 pounds (table 12), compared with an average 61-pound differential between the U. S. average yields for hydraulic presses on the one hand and prepress-solvent extraction on the other. Refined comparisons are impossible with the data available. Nevertheless, there are various indications that are largely in agreement.

The average deviation in oil recovery between the averages of the various extraction processes for the industry as a whole was approximately 20 pounds per ton for the 1951-52 season. Comparisons of the averages for individual types of processes indicate clearly that a very substantial improvement in oil yield occurred with the shift to improved processes. Maximum oil outturn per ton of cottonseed processed is of prime concern to the cottonseed oil mill operator because, pound for pound, the crude cottonseed oil is by far his most valuable product.

Variation within a given method of extraction was greatest among the screw-press mills. The range of variation, as shown in table 13, was 40 pounds. A substantial part of the variation within any type of processing technique may be attributed to variation in the quality of the cottonseed processed. Generally speaking, cottonseed produced in the western part of the Cotton Belt grades higher than that from the eastern part. The oil outturn data, by States, substantiate these observations.

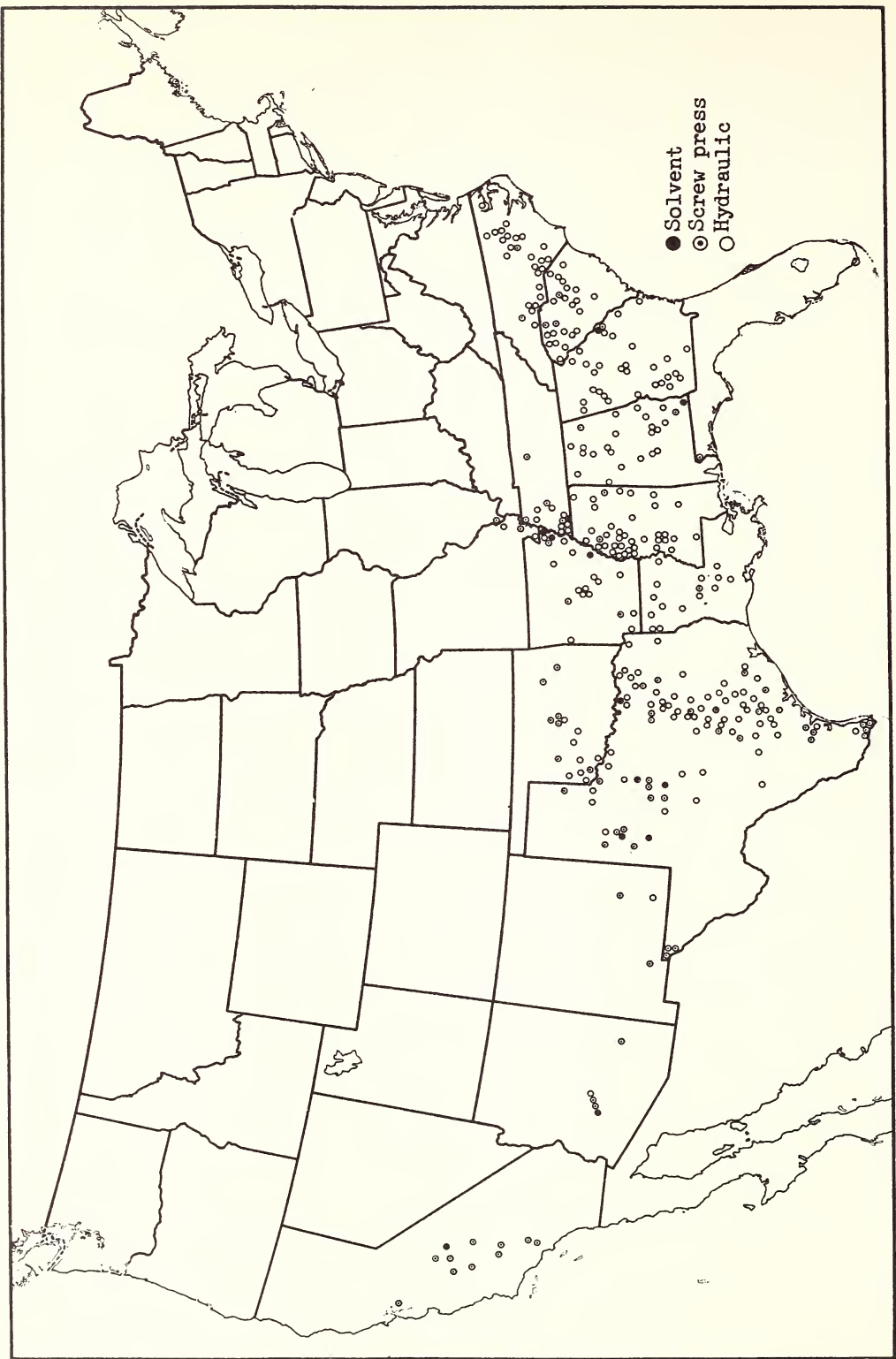


Figure 5.--Location of mills processing cottonseed, by type of equipment, 1951-52

TABLE 11.--Quantities of cottonseed processed and crude oil produced, by method of extraction, United States, by regions and States, 1951-52 season<sup>1</sup>

Region and State	Hydraulic press			Screw press			Direct solvent extraction			Prepress solvent extraction			Total	
	Quantity processed	Oil produced	Oil yield per ton	Quantity processed	Oil produced	Oil yield per ton	Quantity processed	Oil produced	Oil yield per ton	Quantity processed	Oil produced	Quantity processed	Oil produced	Oil yield per ton
United States.....	Tons 3,111,679	1,000 pounds 954,861	Pounds 307	Tons 1,728,397	1,000 pounds 568,260	Pounds 329	Tons 318,661	1,000 pounds 110,957	Pounds 34.8	Tons 317,818	1,000 pounds 116,996	Tons 25,476,555	1,000 pounds 2 1,751,074	Pounds 320
Southeast														
Alabama-Georgia.....	607,186	179,756	296	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	714,263	215,102	301
North Carolina-South Carolina.....	445,389	137,799	309	17,955	5,627	313	--	--	--	--	--	463,344	143,426	310
Total.....	1,052,575	317,555	302	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	1,177,607	358,528	304
Valley														
Arkansas-Tennessee....	465,939	149,999	322	112,677	35,127	312	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	759,995	248,886	327
Louisiana-Mississippi.	743,584	231,650	312	( <sup>2</sup> )	( <sup>2</sup> )	312	--	--	--	( <sup>2</sup> )	( <sup>2</sup> )	802,165	249,993	312
Total.....	1,209,523	381,649	316	( <sup>2</sup> )	( <sup>2</sup> )	312	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	1,562,160	498,879	319
Southwest														
Arizona-California....	( <sup>2</sup> )	( <sup>2</sup> )	( <sup>2</sup> )	686,389	228,474	333	--	--	--	( <sup>2</sup> )	( <sup>2</sup> )	925,182	309,283	334
Oklahoma-Texas.....	690,566	205,160	297	737,287	242,924	329	( <sup>2</sup> )	( <sup>2</sup> )	350	( <sup>2</sup> )	( <sup>2</sup> )	1,679,844	541,165	322
Total.....	( <sup>2</sup> )	( <sup>2</sup> )	300	1,423,676	471,398	331	( <sup>2</sup> )	( <sup>2</sup> )	350	255,407	94,756	2,605,026	850,448	326
All other.....	( <sup>2</sup> )	( <sup>2</sup> )	316	( <sup>2</sup> )	( <sup>2</sup> )	338	--	--	--	--	--	131,762	43,219	328
Florida, Illinois, Missouri and New Mexico														

<sup>1</sup> August 1, 1951 through July 31, 1952. Mills using more than one type of extraction process classified according to their major type of process.<sup>2</sup> The insignificant difference between this figure and the corresponding figures in tables 14 and 15 is due to different procedures in collection and utilization of data.<sup>3</sup> Not shown to avoid disclosure of individual processors' operations.

Source: Compiled from a special survey made by the Bureau of the Census in cooperation with the U.S. Dept. of Agr.

TABLE 12.--Yield of crude cottonseed oil per ton of cottonseed processed, by method of extraction, United States, by regions and States, 1951-52 season<sup>1</sup>

Region and State	Hydraulic press	Screw press	Direct solvent extraction	Prepress solvent extraction
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
United States.....	307	329	348	368
<u>Southeast</u> .....	302	310	(2)	(2)
Alabama.....	296	(2)	--	(2)
Georgia.....	296	(2)	(2)	--
North Carolina.....	308	(2)	--	--
South Carolina.....	312	312	--	--
<u>Valley</u> .....	316	312	(2)	(2)
Arkansas.....	324	(2)	(2)	(2)
Louisiana.....	296	(2)	--	(2)
Mississippi.....	316	318	--	--
Tennessee.....	318	306	(2)	--
<u>Southwest</u> .....	300	332	350	372
Arizona.....	(2)	346	--	(2)
California.....	(2)	330	--	(2)
Oklahoma.....	300	306	--	--
Texas.....	296	332	350	(2)
All other States.....	316	338	--	--

<sup>1</sup> August 1, 1951, through July 31, 1952.

<sup>2</sup> Not shown to avoid disclosure of individual processors' operations.

Source: Compiled from a special survey made by the Bureau of the Census in cooperation with the U. S. Dept. of Agr.

TABLE 13.--United States average and range of State averages of oil outturn per ton of cottonseed processed, by method of extraction, 1951-52 season

Method extraction	U. S. average	Highest		Lowest		Range
	<i>Pounds</i>	<i>Pounds</i>	<i>State</i>	<i>Pounds</i>	<i>State</i>	<i>Pounds</i>
Hydraulic press.....	307	324	Arkansas	296	Alabama, Georgia, Louisiana, and Texas	28
Screw press.....	329	346	Arizona	306	Tennessee and Oklahoma	40
Direct solvent.....	348	350	Texas	348	U. S. average	2
Prepress solvent....	368	372	Southwest	368	U. S. average	4
All types.....	320	340	Arizona	296	Alabama	44

## Cottonseed Oil Mill Operations

Obtaining the maximum supply of seed is a basic problem for most mills because of the industry's excess crushing capacity.<sup>6</sup> Each crusher wishes to utilize as much of his capacity as possible in order to cut overhead costs to a minimum. Furthermore, fluctuations in seed supply, due to crop factors beyond their control, have compelled millers to compete more aggressively in some years than in others for the existing supply.

The quantity of cottonseed processed in 1951-52 was 87 percent of the cottonseed production, and the 5-year average, 1947-48 through 1951-52, was 88 percent.

The average during the 5 years varied from 86 percent in 1949 to 91 percent in 1950. There was a tendency for the industry to crush a larger proportion of the crop in small crop years.

Receipts of cottonseed at the oil mills are heaviest during the cotton-harvest season. Approximately 90 percent of the total annual receipts in the 1951-52 season had reached the oil mills by the end of December. October was the peak month for seed receipts. About 1.6 million tons, or almost 30 percent of the cottonseed crop, reached the mills during that month. September and November were the months with next largest receipts, 1 million tons of cottonseed each. Of course, the variation geographically in the time of harvest results in a somewhat greater spread in seed receipts for the industry than would be expected for a given location.

Cottonseed crushing begins as soon as enough seed is on hand to insure continuous operation. A few mills start operations in August, depending on location and crop conditions, but most of them start in September and October.

About 2.6 million tons, or almost one-half of the 1951-52 total crush, were handled by the mills in the Southwest; 1.6 million tons, or 30 percent, by those in the Valley, and 1.2 million tons, or about 20 percent, by those in the Southeast (fig. 6 and table 14).

About two-thirds of the 1951-52 season crush occurred during the 5-month September-January period (table 15). The peak-month crush, as in most years, occurred in October, the month of peak seed receipts. That month the crush was 838 thousand tons, or 15 percent of the season's total. Monthly crushings thereafter dwindled approximately 100 thousand tons per month.

Crude cottonseed oil is the most important product recovered from the crushing operations, and crushers are continually striving to improve oil outturn. Although the cottonseed crusher does not control the quality of the cottonseed produced, he does have a certain degree of control over the maintenance of its quality in his seedhouses or tanks. Furthermore, in addition to quality maintenance, there are other ways in which a processor can influence outturn.

The industry average oil outturn per ton of cottonseed processed in 1951-52 was 320 pounds for the whole season. Monthly variation of oil outturns has not been studied in detail in this analysis, but, as reported to the Bureau of the Census, it varied from 302 pounds in August to 350 pounds the following July, or a range of 48 pounds. Whether this shows seasonal improvement was actual or only apparent cannot be determined without a special detailed study. Oil content of the seed cannot be expected to change perceptibly except in cases where the seed deteriorates greatly. Nevertheless, some factors were observed which might partially explain an improvement in oil outturn as the season moved on. Plants operating the shorter seasons were generally hydraulic mills having the lower recovery rate, whereas the longer-season mills included a larger number of the more efficient screw-press and solvent-extraction mills. Furthermore, hydraulic processors operating long seasons tend to adjust the press cycle after the peak month crush in order to allow more drainage time, thereby increasing the oil recovery. It is not regarded as certain, however, that the increase is fully explained.

Variations in oil outturns result primarily from variations in type of mill, operating methods and practices, and the quality of the cottonseed processed. For example, during the 1951-52 season, mills using the prepress-solvent-extraction process recovered 60 pounds more of oil per ton of seed processed than did the hydraulic mills. An individual

<sup>6</sup>Kromer, G. W., and Smith, T. B., Cottonseed Oil Mill Characteristics and Marketing Practices. PMA, U.S. Dept. Agr. 1951.

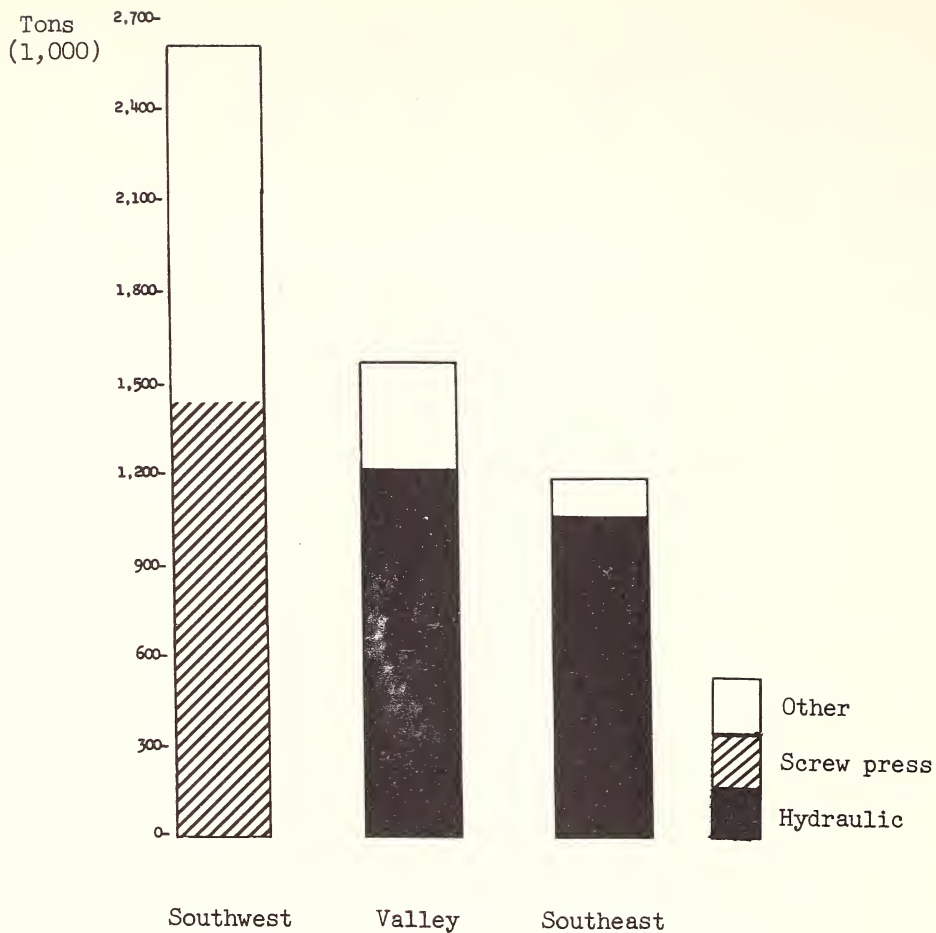


Figure 6.--Quantities of cottonseed processed, by major type of equipment, U. S., by Regions, 1951-52

crusher may be able to improve his competitive position by adopting the more efficient methods, and the fact that during 1951-52 only about 57 percent of the cottonseed was processed by the less efficient hydraulic method is an indication that this possibility is being pursued.

Other important cottonseed products are cake or meal, linters, and hulls. Some mills also recover minor products such as motes, grabbots, and flues.

Cake and meal production in the 1951-52 season was 2.5 million tons; cottonseed hull production was 1.2 million tons; and linters production was 1.7 million running bales (net weight).

Table 16 summarizes the cottonseed industry average outturn of products for the 1951-52 season.

TABLE 14.--Cottonseed oil mill operations, United States, by regions and States, 1951-52 season<sup>1</sup>

Region and State	Cottonseed		Cottonseed products									
	Production	Crushed	Crude oil		Cake and meal		Hulls		Linters <sup>2</sup>		Total outturn per ton	
			Produced	Outturn per ton	Produced	Outturn per ton	Produced	Outturn per ton	Produced	Outturn per ton		
United States.....	1,000 tons 6,301	Tons 3 5,475,288	1,000 pounds 3 1,750,783	Pounds 320	Tons 2,546,954	Pounds 930	Tons 1,234,462	Pounds 451	Running bales 1,747,033	Pounds 185	Pounds 1,886	
Southeast:												
Alabama.....	377	267,259	79,442	297	133,725	1,001	66,110	494	80,373	176	1,968	
Georgia.....	382	443,325	134,091	302	210,294	949	98,250	443	150,822	201	1,895	
North Carolina.....	231	223,218	68,563	307	105,876	949	47,036	421	82,081	221	1,898	
South Carolina.....	372	239,236	74,804	313	110,901	927	48,430	405	86,724	212	1,857	
Total.....	1,362	1,173,038	356,900	304	560,796	956	259,826	443	400,000	198	1,901	
Valley:												
Arkansas.....	526	397,570	130,997	330	172,954	870	90,532	455	122,352	180	1,835	
Louisiana.....	310	224,085	66,831	298	107,039	955	51,006	455	59,713	159	1,867	
Mississippi.....	655	579,655	183,526	317	272,997	942	123,357	426	171,983	178	1,863	
Tennessee.....	217	365,083	119,952	329	161,216	883	85,478	468	108,941	179	1,859	
Total.....	1,708	1,566,393	501,306	320	714,206	912	350,373	447	462,989	172	1,851	
Southwest:												
Arizona.....	348	264,650	89,397	338	111,538	843	67,886	513	81,997	177	1,871	
California.....	702	663,400	220,081	332	299,475	903	143,772	433	252,692	211	1,879	
Oklahoma.....	188	170,500	50,453	296	80,858	948	37,309	438	57,038	190	1,872	
Texas.....	1,718	1,505,283	489,429	325	722,766	960	344,414	458	445,817	171	1,914	
Total.....	2,956	2,603,833	849,360	326	1,214,637	933	593,381	456	837,544	187	1,902	
All other States.....	275	132,024	43,217	328	57,315	868	30,882	468	46,500	206	1,870	

<sup>1</sup> August 1, 1951, through July 31, 1952.<sup>2</sup> Net weight.<sup>3</sup> The insignificant difference between this figure and the corresponding figure in table 11 is due to different procedures in collection and utilization of data.

Source: Cotton Production and Distribution, Bulletin 189, Bureau of the Census.

TABLE 15.--Cottonseed oil mill operations, United States, by months, 1951-52 season

Month	Cottonseed			Cottonseed products									Total outturn per ton
	Received	Crushed	Stocks	Crude oil		Cake and meal		Hulls		Linters <sup>1</sup>			
				Produced	Outturn per ton	Produced	Outturn per ton	Produced	Outturn per ton	Produced	Outturn per ton		
1951	Tons	Tons	Tons	1,000 pounds	Pounds	Tons	Pounds	Tons	Pounds	Running bales	Pounds	Pounds	
August.....	555,550	199,371	422,460	60,200	302	92,222	925	44,104	442	63,819	186	1,855	
September.....	1,077,010	543,428	956,042	167,168	308	251,099	924	120,365	443	176,151	2 189	1,864	
October.....	2 1,591,273	2 837,547	1,709,768	2 259,819	310	387,447	925	2 183,193	437	2 267,066	186	1,858	
November.....	1,032,722	776,093	2 1,966,397	244,053	314	361,949	933	172,561	445	246,838	185	1,877	
December.....	616,996	652,542	1,930,851	206,005	316	303,841	931	149,459	458	205,138	183	1,888	
1952													
January.....	325,197	694,589	1,561,459	221,090	318	323,098	930	158,376	456	222,551	186	1,890	
February.....	163,359	545,314	1,179,504	176,041	323	253,208	929	125,007	458	174,564	186	1,896	
March.....	55,150	432,902	801,752	143,727	332	201,182	929	99,628	460	140,036	188	1,909	
April.....	22,325	305,597	518,480	106,633	349	146,191	2 957	70,456	461	99,405	189	2 1,956	
May.....	14,373	217,667	315,186	72,082	331	101,133	929	48,234	443	69,847	187	1,890	
June.....	13,725	152,799	176,112	52,822	346	69,838	914	35,883	2 470	46,053	175	1,905	
July.....	78,225	117,439	136,898	41,143	2 350	55,746	949	27,196	463	35,565	176	1,938	
Season.....	5,545,905	3 5,475,288		3 1,750,783	320	2,546,954	930	1,234,462	451	1,747,033	185	1,886	

<sup>1</sup> Net weight.<sup>2</sup> Big month.<sup>3</sup> The insignificant difference between this figure and the corresponding figure in table 11 is due to different procedures in collection and utilization of data.

Source: Cotton Production and Distribution, Bulletin 189, Bureau of the Census.

TABLE 16.--Average yield of products per ton of cottonseed crushed,  
United States, 1951-52 season

Product	Yield per ton of cottonseed	
	Pounds	Percent
Crude oil.....	320	16.0
Cake and meal.....	930	46.5
Linters <sup>1</sup> .....	185	9.3
Hulls.....	451	22.5
Processing loss <sup>2</sup> .....	114	5.7
Total.....	2,000	100.0

<sup>1</sup> Net weight.

<sup>2</sup> Difference between total yield and 2,000 pounds considered processing loss. Includes motes, grabbots, and loss of moisture

In general, the data available show an increase in oil yield and in hull yield as the crushing season advances. Insofar as the increase is actual instead of the result of the method of making up mill records, it probably is due in part to increasing efficiency in oil recovery, and in part to decreasing processing loss in the earlier operations, such as delinting and hulling.

## FLAXSEED

### Location of Linseed Oil Mills

During the 1951-52 season, 23 mills were processing flaxseed in the United States for linseed oil and cake or meal. Some crushed flaxseed exclusively whereas some crushed only small quantities of flaxseed, in addition to other oilseeds. Almost one-half of the mills were in Minnesota (6) and California (5), the others being widely scattered through 10 States (fig. 7).

Seventeen of the mills were using screw presses. Five others were using direct-solvent or prepress-solvent-extraction processes. Minnesota had 1 direct-solvent and 2 prepress-solvent mills; Ohio, 1 direct-solvent; and California, 1 prepress-solvent. One mill in North Dakota processed flaxseed by the hydraulic-press method (table 17).

### Linseed Oil Mill Operations

Receipts of flaxseed at the oil mills for the five crops 1947 through 1951 represented 83 percent of the flaxseed produced. The percentage of the crop crushed varied from 66 to 107 percent. (In the 1950-51 season, the quantity processed exceeded domestic production--the excess coming from carryover stocks mainly as a conversion of Government-owned stocks from seed to oil.)

Substantial quantities of flaxseed are received at the processing plants every month of the year, although not all mills have year-round receipts. About two-thirds of the 1951 crop was received during the first half of the marketing season, the largest monthly movement occurring in October. About 5.2 million bushels, or 19 percent of the flaxseed crop, reached the mills during that month.

The marketing and processing season for flaxseed begins in July and runs through June. The season differs geographically, of course, between the northern spring-crop region and the southwestern winter-crop region, and the seasonality of mill receipts and operations varies accordingly. The total supply of flaxseed for the 1951-52 season was 47 million bushels (table 18). Production for the season amounted to almost 35 million bushels, from which the mills received 28 millions. The quantity processed for oil and meal was 30 million bushels, or approximately 86 percent of the crop. The rest was used for seed and export.

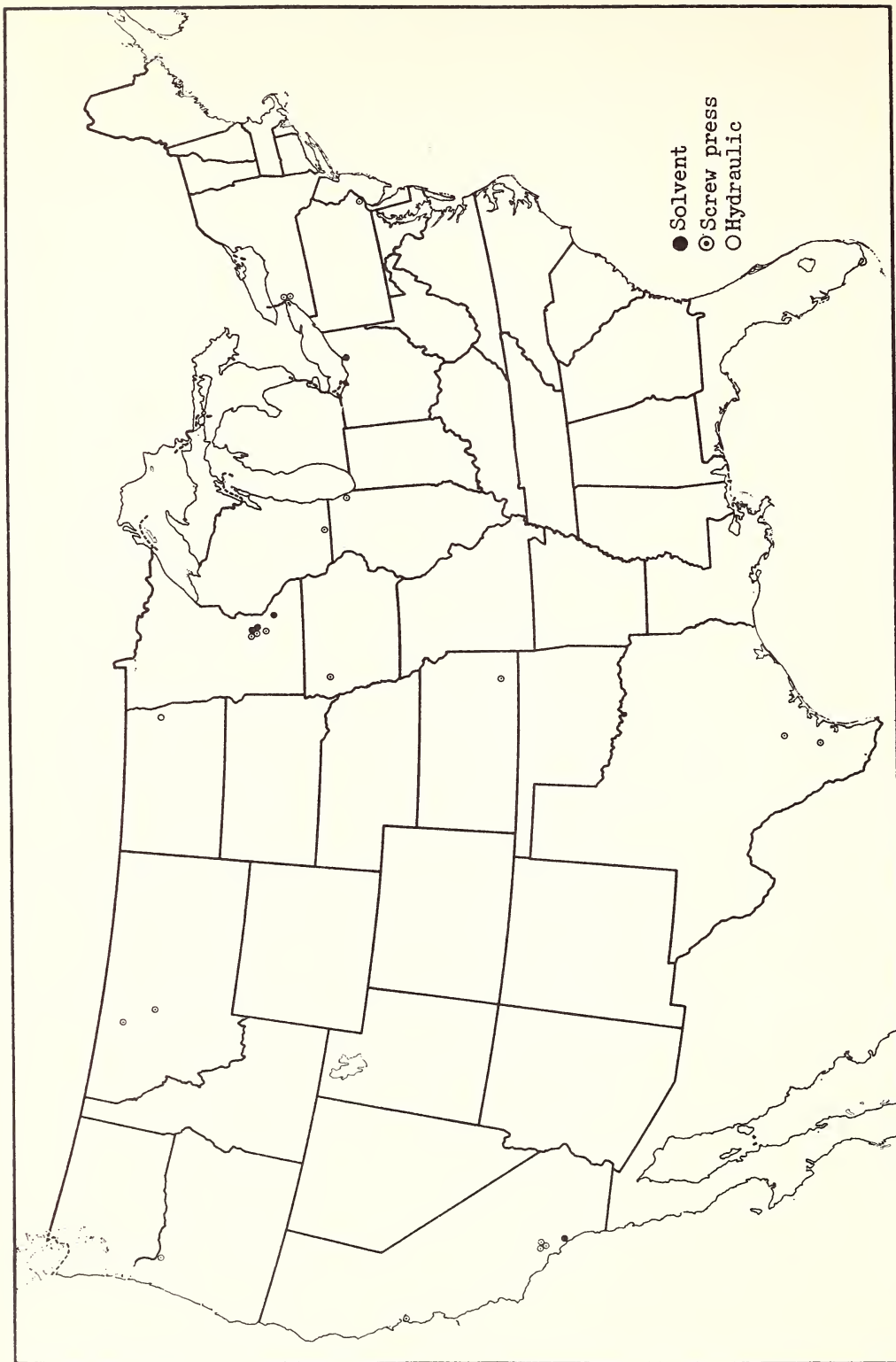


Figure 7.--Location of mills processing flaxseed, by type of equipment, 1951-52

TABLE 17.--Number of linseed oil mills, by method of extraction United States, by States, 1951-52 season<sup>1</sup>

State	Hydraulic press	Screw press	Direct- solvent extraction	Prepress solvent extraction	Total
	<i>Number</i> 1	<i>Number</i> 17	<i>Number</i> 2	<i>Number</i> 3	<i>Number</i> 23
United States.....					
California.....	--	4	--	1	5
Illinois.....	--	1	--	--	1
Iowa.....	--	1	--	--	1
Kansas.....	--	1	--	--	1
Minnesota.....	--	3	1	2	6
New York.....	--	2	--	--	2
North Dakota.....	1	--	--	--	1
Ohio.....	--	--	1	--	1
Oregon.....	--	1	--	--	1
Pennsylvania.....	--	1	--	--	1
Texas.....	--	2	--	--	2
Wisconsin.....	--	1	--	--	1

<sup>1</sup> July 1, 1951, through June 30, 1952. Mills using more than one type of extraction process are classified according to the major type of process.

Source: Compiled from a special survey made by the Bureau of the Census in cooperation with the U. S. Dept. Agr.

Flaxseed crushed in the 1951-52 season amounted to 30 million bushels (table 19). Of this amount, the screw-press method accounted for about 53 percent, or 15.6 million bushels, as compared with 31 percent, or 9.1 million bushels, by prepress-solvent extraction. The remaining 16 percent was processed primarily by direct-solvent extraction.

Minnesota was the leading State in processing, and accounted for 21.3 million bushels, or 72 percent of the total. California ranked second with a crush of about 2 million bushels, or 7 percent of the total.

Although the screw-press mills represented 75 percent of the total number of flaxseed mills, they accounted for only 53 percent of the total crush for the country. The solvent mills processed a greater average quantity of flaxseed than did the screw-press mills.

Among the States, California, where oil content of the seed is relatively high, led in oil outturn with 20.8 pounds per bushel, and Minnesota ranked a close second with 20.4 pounds. The lowest oil outturn reported, 18.7 pounds per bushel, was the average of 7 States--Montana, Texas, Kansas, Iowa, Oregon, Wisconsin, and North Dakota. The mills in all those States except North Dakota were of the screw-press type.

Crude linseed oil yield by the prepress-solvent method for the industry was 20.9 pounds in comparison with 19.9 pounds by the screw-press method.

Because of the small number of processors, little census information on method of extraction can be made available by States. The only such breakdown possible is for California, where screw-press mills had an oil outturn of 21.1 pounds per bushel, which was well above the averages for other States and for the industry.

Comparing the three major oilseeds--soybeans, cottonseed, and flaxseed--the quantities crushed after the peak month drop off more slowly for soybeans and flaxseed than for cottonseed. In the 1951-52 season, the average monthly crush for soybeans and flaxseed was 83 percent of the peak month crush whereas the corresponding figure for cottonseed was only 50 percent.

TABLE 18.--Flaxseed supply and disappearance, United States, crop years 1947-48 through 1953-54

Crop year	Supply				Disappearance				
	Stocks (beginning of year)	Imports	Production	Total	Used for seed	Crushed <sup>1</sup>	Exports	Other disappearance <sup>2</sup>	Total
	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels	1,000 bushels
1947-48	1,691	721	40,618	43,030	3,204	29,871	22	2,707	35,804
1948-49	7,226	618	54,803	62,647	3,505	36,024	4,674	- 920	43,283
1949-50	19,364	2	42,976	62,342	2,769	38,453	1,991	2,160	45,373
1950-51	16,969	--	40,236	57,205	2,743	43,037	2,874	- 3,736	44,918
1951-52	12,287	--	34,696	46,983	2,326	<sup>3</sup> 30,128	4,169	- 1,158	35,465
1952-53	11,518	--	30,174	41,692	2,733	25,407	199	3,400	31,739
1953-54	9,953	--	36,813	46,766	110	<sup>4</sup> 13,775	1	- 1,819	<sup>4</sup> 12,067

<sup>1</sup> Reported by Bureau of the Census. Crushings of new seed in the April-June quarter have been deducted and added to the following quarter since 1947.

<sup>2</sup> Other disappearance represents cleaning loss, waste, and statistical errors of estimates.

<sup>3</sup> The insignificant difference between this figure and the corresponding figures in tables 19 and 20 is due to different procedures in collection and utilization of data.

<sup>4</sup> July through December 1953.

Source: U. S. Dept. Agr.

This situation probably is partly attributable to the fact that there is greater excess crushing capacity in the cottonseed industry and that cottonseed is not a readily storable commodity.

Flaxseed stored at oil mills represented only a small part of the total stored in the 1951-52 season. The bulk was stored on farms and at country elevators, whereas lesser amounts were stored at terminals. Stocks at the oil mills ranged from 1 to 3 times the average monthly crush. The peak month of storage at the mills was December 1951, when 7 million bushels were on hand at the end of the month (table 20). The relatively good storability of flaxseed, except in Texas (where the quantity produced is relatively small), contributes appreciably to the uniform operation of the processing plants.

Flaxseed products obtained by the mills are linseed oil and linseed cake or meal. The oil is used primarily in drying-oil products. The cake and meal are used principally in livestock feeds. The oil is the most valuable product recovered from the processing operation.

Average oil outturn per bushel of flaxseed processed during the 1951-52 season was 20.14 pounds. The principal reasons for variations in oil outturn between processing plants are the method of extraction and the oil content of the seed. Accordingly, there was moderate variation in oil outturn between individual mills by method of extraction. There was surprisingly little variation, however, between industry monthly averages during the 1951-52 season. The highest average monthly oil outturn was 20.82 pounds as compared with the lowest monthly outturn of 19.26, or a range of about 1½ pounds. There was no apparent increase or decrease in oil outturn as the season progressed.

Meal outturn per bushel of flaxseed processed averaged 36 pounds, varying from 34 pounds to 37 pounds.

TABLE 19.--Quantities of flaxseed processed and crude oil produced, by method of extraction, United States, by States, 1951-52 season<sup>1</sup>

State	Hydraulic press			Screw press			Direct-solvent extraction			Prepress-solvent extraction			Total	
	Quantity processed	Oil produced	Oil yield per bu.	Quantity processed	Oil produced	Oil yield per bu.	Quantity processed	Oil produced	Oil yield per bu.	Quantity processed	Oil produced	Oil yield per bu.	Quantity processed	Oil produced
United States.....	Bushels (2)	1,000 pounds (2)	Pounds (2)	Bushels 15,605,877	1,000 pounds 309,900	Pounds 19.9	Bushels (2)	1,000 pounds (2)	Pounds (2)	Bushels 9,077,232	1,000 pounds 189,970	Pounds 20.9	Bushels 3,29,664,404	1,000 pounds 3,602,225
Minnesota.....	--	--	--	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	21,278,732	434,917
California.....	--	--	--	(2)	(2)	21.1	--	--	--	1,971,085	40,972	(2)	1,971,085	40,972
New York, Pennsylvania, Ohio, and Illinois.....	--	--	--	(2)	(2)	19.8	(2)	(2)	(2)	--	--	--	5,843,192	115,666
All other (Montana, Texas, Kansas, Iowa, Oregon, Wisconsin, and North Dakota)	(2)	(2)	(2)	(2)	(2)	18.7	--	--	--	--	--	--	571,395	10,670

<sup>1</sup> July 1, 1951, through June 30, 1952. Mills using more than one type of extraction process classified according to their major type of process.<sup>2</sup> Not shown to avoid disclosure of individual processors' operations.<sup>3</sup> The insignificant difference between this figure and the corresponding figures in tables 18 and 20, is due to different procedures in collection and utilization of data.

Source: Compiled from a special survey made by the Bureau of the Census in cooperation with the U. S. Dept. of Agr.

TABLE 20.--Linseed oil mill operations, United States, by months, 1951-52 season

Month	Flaxseed			Flaxseed products					
	Received	Crushed	Stocks	Cake and meal		Raw linseed oil			Total outturn per bushel
				Produc- tion	Stocks	Outturn per bushel	Production	Stocks	
1951	<i>Bushels</i> 2,332,720 1,773,823 3,204,008 1 5,212,303 3,840,610 2,847,015	<i>Bushels</i> 1 3,148,586 2,942,933 2,809,627 3,021,887 2,854,050 2,580,583	<i>Bushels</i> 4,428,076 3,258,966 3,653,347 5,843,763 6,830,323 1 7,096,755	<i>Tons</i> 1 57,358 54,829 52,000 54,539 51,642 47,466	<i>Tons</i> 1 44,050 31,843 25,451 17,010 9,931 8,425	<i>Pounds</i> 1 63,396 60,500 57,057 59,964 54,981 52,120	<i>1,000 pounds</i> 633,674 634,748 635,184 640,760 638,785 652,696	<i>Pounds</i> 20.13 20.56 20.31 19.84 19.26 20.20	<i>Pounds</i> 56.56 1 57.82 57.33 55.94 55.45 56.99
1952	<i>Bushels</i> 1,606,950 1,383,405 1,078,692 1,075,549 1,914,949 1,791,177	<i>Bushels</i> 2,297,831 2,243,195 2,195,450 1,897,094 2,083,107 2,171,989	<i>Bushels</i> 6,405,874 5,546,084 4,429,326 3,607,781 3,439,623 3,058,811	<i>Tons</i> 41,301 39,032 38,295 34,485 37,115 38,679	<i>Tons</i> 9,392 12,093 14,898 12,398 17,360 28,970	<i>Pounds</i> 35,95 34.80 34.89 36.36 35.63 35.62	<i>1,000 pounds</i> 652,657 1 659,688 659,383 646,589 638,021 637,975	<i>Pounds</i> 20.39 19.62 1 20.82 20.53 19.99 20.26	<i>Pounds</i> 56.34 54.42 55.71 56.89 55.62 55.88
Season.....	28,061,201	2 30,246,332		546,741		2 609,217		20.14	56.29

1 Big month.

2 The insignificant difference between this figure and the corresponding figures in tables 18 and 19 is due to different procedures in collection and utilization of data.

Source: Facts for Industry, Bureau of the Census.

## SOME RECENT CHANGES IN THE OILSEED-PROCESSING INDUSTRY

Locations of oil mills crushing major vegetable oilseeds in the United States during 1953 are shown in figure 8, and those crushing minor vegetable oilseeds in figure 9. Most of the major-oilseed mills crushed cottonseed and soybeans. The number of mills processing minor oilseeds, obviously, was small.

For 9 kinds of oilseeds several comparisons may be made for the 1949-50 and 1952-53 seasons.<sup>7</sup> In addition to soybeans, cottonseed, and flaxseed, these 9 kinds include peanuts, corn germs, tung nuts, copra, castor beans, and olives. Locations of the mills processing each of these kinds of oilseed are shown in table 21. The average volumes processed in 1949-50 vary from 34,000 tons per mill for castor beans to about 100 tons for olives. In 1952-53 the corn germ mills, with a 35,711 ton average, had the largest volume. Nevertheless, the 2 major oilseeds--soybeans and cottonseed--still represented by far the largest 2 industries in the oilseed-processing field (table 22).

In general, oilseed mills were decreasing in number and increasing in size. The net decrease in vegetable oil mills between 1949-50 and 1952-53 was 30. Decreases in numbers shown in table 22 largely represent mills that in the former season were processing 2 or more oilseeds but by 1952-53 had discontinued at least 1 of them.

For the most part, oil yields increased during the period, although this change showed much irregularity. Both more efficient methods and better yielding strains of oilseeds undoubtedly played a part in this increase, better methods playing a major role.

Because of general similarities throughout the industry, it may be assumed that tendencies among mills processing minor oilseeds, for which data are not available, have followed the same pattern as for mills processing major oilseeds.

Through these changes in the vegetable oil industry the seasonal variations in operations of the mills appear to have remained essentially fixed. Fluctuations often appear from month to month, but these probably cannot be assumed to have more than momentary significance.

Throughout its history the vegetable oil industry has been characterized by changes, or innovations, in processing methods and practices. The changes have been developed to reduce cost, raise quality of products, or otherwise improve the competitive position of the industry, and in so doing they have contributed to the efficiency and service of the whole marketing system.

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<sup>7</sup> In 1950 the U. S. Dept. of Agr. published information on the number of mills processing major and minor vegetable oilseeds in the United States. This is the first publication of data for 1952-53.

TABLE 21.--Vegetable oilseed mills in the United States, by States and kinds of oilseed crushed, 1953

State	All oilseed mills	Major oilseed mills	Mills crushing major oilseeds only												
			Soybeans	Cottonseed	Flaxseed	Peanuts	Corn germ	Cottonseed and soybeans	Cottonseed and peanuts	Cottonseed and flaxseed	Soybeans and peanuts	Soybeans and flaxseed	Soybeans and corn germ	Cottonseed, soybeans, and peanuts	Cottonseed, soybeans, and flaxseed
	Number	umber	umber	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Alabama.....	30	28	1	12	--	2	--	3	8	--	--	--	--	2	--
Arizona.....	5	5	--	5	--	--	--	--	--	--	--	--	--	--	--
Arkansas.....	20	20	1	7	--	--	--	12	--	--	--	--	--	--	--
California <sup>1</sup> .....	102	23	2	7	2	--	--	--	--	5	--	4	1	--	2
Delaware.....	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--
Florida.....	8	2	--	--	--	--	--	--	--	--	--	--	--	2	--
Georgia.....	39	39	1	13	--	6	--	4	13	--	1	--	--	1	--
Illinois.....	33	33	28	--	--	--	2	1	--	--	--	--	1	1	--
Indiana.....	11	11	10	--	--	--	1	--	--	--	--	--	1	1	--
Iowa.....	28	28	25	--	--	--	1	--	--	--	--	--	--	--	--
Kansas.....	6	6	2	--	--	--	--	--	--	--	--	4	--	--	--
Kentucky.....	3	3	3	--	--	--	--	--	--	--	--	--	--	--	--
Louisiana.....	20	16	--	15	--	--	--	1	--	--	--	--	--	--	--
Minnesota.....	12	12	4	--	3	--	--	--	--	--	--	5	--	--	--
Mississippi.....	41	39	1	25	--	--	--	13	--	--	--	--	--	--	--
Missouri.....	12	12	7	--	--	--	2	3	--	--	--	--	--	--	--
Montana.....	1	1	--	--	1	--	--	--	--	--	--	--	--	--	--
North Carolina.....	28	28	--	11	--	--	--	6	3	--	1	--	--	7	--
North Dakota <sup>1</sup> .....	2	1	--	--	--	--	--	--	--	--	--	1	--	--	--
Nebraska.....	3	3	3	--	--	--	--	--	--	--	--	--	--	--	--
New Jersey <sup>1</sup> .....	6	2	1	--	1	--	--	--	--	--	--	--	--	--	--
New Mexico.....	4	4	--	3	--	1	--	--	--	--	--	--	--	--	--
New York <sup>1</sup> .....	5	4	1	--	--	--	--	--	--	--	--	3	--	--	--
Ohio.....	14	14	13	--	1	--	--	--	--	--	--	--	--	--	--
Oklahoma <sup>1</sup> .....	17	16	1	8	--	2	--	5	--	--	--	--	--	--	--
Oregon <sup>1</sup> .....	2	1	--	--	1	--	--	--	--	--	--	--	--	--	--
Pennsylvania.....	2	2	1	--	--	--	--	--	--	--	--	1	--	--	--
South Carolina.....	23	23	--	16	--	--	--	7	--	--	--	--	--	--	--
South Dakota.....	1	1	--	--	--	--	--	--	--	--	--	1	--	--	--
Tennessee.....	16	16	2	8	--	--	--	6	--	--	--	--	--	--	--
Texas <sup>1</sup> .....	97	95	--	77	1	8	--	--	4	4	--	--	--	--	1
Virginia.....	3	3	1	--	--	1	--	--	--	--	1	--	--	--	--
Wisconsin.....	2	2	1	--	--	--	--	--	--	--	--	1	--	--	--
Total <sup>2</sup> .....	597	494	110	207	10	20	6	61	28	9	3	22	3	12	3

State	Minor oilseed mills	Mills crushing minor oilseeds only																	
		Tung	Copra	Castor beans	Olives	Sunflower seed	Rice bran	Olive pomace	Olives and rice bran	Olive pomace, grape-seed, and mustard seed	Copra and babassu	Copra, babassu, and sesame	Copra, babassu, and rape-seed	Copra, babassu, castor beans, and palm kernels	Copra, babassu, mustard-seed, and other oilseed	Copra, babassu, castor beans, and other oilseed	Copra, castor beans, and sesame	Copra, castor beans, sesame, and safflower	Miscellaneous minor oilseeds
	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number	Number
Alabama.....	2	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
California <sup>1</sup> .....	79	--	7	1	58	--	2	1	1	1	2	1	--	--	1	1	1	1	1
Florida.....	6	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Louisiana.....	4	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mississippi.....	2	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
North Dakota <sup>1</sup> .....	1	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
New Jersey <sup>1</sup> .....	4	--	--	3	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--
New York <sup>1</sup> .....	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--
Oklahoma <sup>1</sup> .....	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Oregon <sup>1</sup> .....	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Texas <sup>1</sup> .....	2	--	1	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--
Total.....	103	14	9	5	58	1	3	1	1	1	2	1	1	1	1	1	1	1	1

<sup>1</sup> Nineteen mills crush both major and minor oilseeds. These mills are listed below, according to State, kinds of oilseeds crushed, and number of mills crushing these seeds:

California: Soybeans; copra--1 mill  
Soybeans; babassu, copra--1 mill  
Flaxseed; babassu, copra--1 mill  
Flaxseed; copra, castor beans, safflower, sesame--1 mill  
Cottonseed, flaxseed; copra--2 mills  
Cottonseed, flaxseed; castor beans, copra, sesame--1 mill  
Cottonseed, flaxseed; miscellaneous minor vegetable oilseeds--1 mill  
Soybeans, flaxseed; copra--2 mills  
Soybeans, flaxseed; babassu, copra, mustardseed, and other oilseed--1 mill  
Soybeans, flaxseed; castor beans, babassu, copra, sesame, and other oilseed--1 mill  
North Dakota: Soybeans, flaxseed; sunflower seed--1 mill  
New Jersey: Soybeans; babassu, copra, palm kernels, castor beans--1 mill; Flaxseed; castor beans--1 mill  
New York: Soybeans, flaxseed; babassu, copra, rapeseed--1 mill  
Oklahoma: Cottonseed, soybeans; castor beans--1 mill  
Oregon: Flaxseed; copra--1 mill  
Texas: Cottonseed, flaxseed; copra--1 mill

<sup>2</sup> From the total number of mills 19 should be subtracted because this group is included in the mills that process both the major and minor oilseeds. The number of dormant mills, including six feeder mills, is 62. These mills are not included in the total.

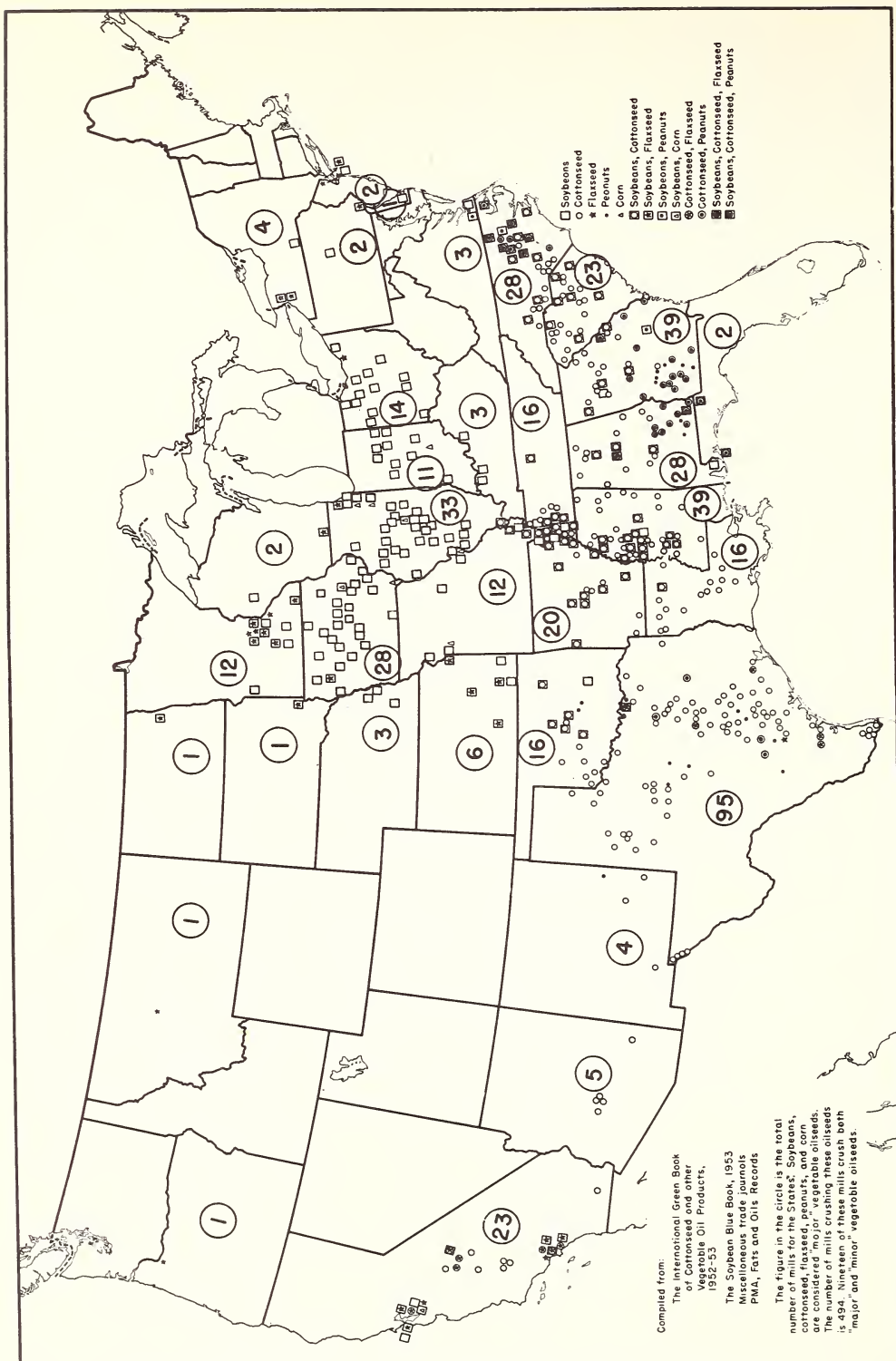
Source: Compiled from the International Green Book of Cottonseed and Other Vegetable Oil Products, 1952-53; The Soybean Blue Book, 1953; miscellaneous trade journals; U.S. Dept. Agr. records; and records of the Department of Public Health, State of California (olive oil mills).

TABLE 22.--Vegetable oilseed mills: Number, volume of crush, and oil outturn, U. S., 1949-50 and 1952-53 seasons

Oilseed	1949-50 season			1952-53 season			Change			
	Number of active mills	Average per mill		Number of active mills	Average per mill		Number of active mills <sup>1</sup>	Average per mill		
		Crush	Oil out-turn per ton		Crush	Oil out-turn per ton		Crush	Oil outturn per ton	
		Tons	Pounds		Tons	Pounds	Percent	Percent	Pounds	Percent
Soybeans.....	262	22,359	331	214	32,847	361	-18	2 47	30	9.1
Cottonseed.....	335	17,051	323	320	17,331	328	- 4	2	5	1.5
Flaxseed.....	51	20,533	695	44	16,031	719	-14	-22	24	3.5
Peanuts.....	76	2,904	832	63	1,102	785	-17	-62	-47	-5.6
Corn germs.....	12	26,460	762	9	35,711	803	-25	35	41	5.4
Copra.....	18	23,102	1,275	18	19,439	1,275	0	-16	0	0
Tung nuts.....	15	5,540	322	14	8,989	334	- 7	62	12	3.7
Castor beans.....	4	34,206	950	9	8,545	935	125	-75	-15	-1.6
Olives.....	54	94	326	59	357	326	9	280	0	0

<sup>1</sup> Changes in numbers shown here largely represent cases in which a mill discontinued crushing a particular oilseed or took on the crushing of an additional one.

<sup>2</sup> This large increase in average crush per mill results from an 18-percent decrease in number of mills and about a 20-percent increase in total quantity of soybeans crushed.



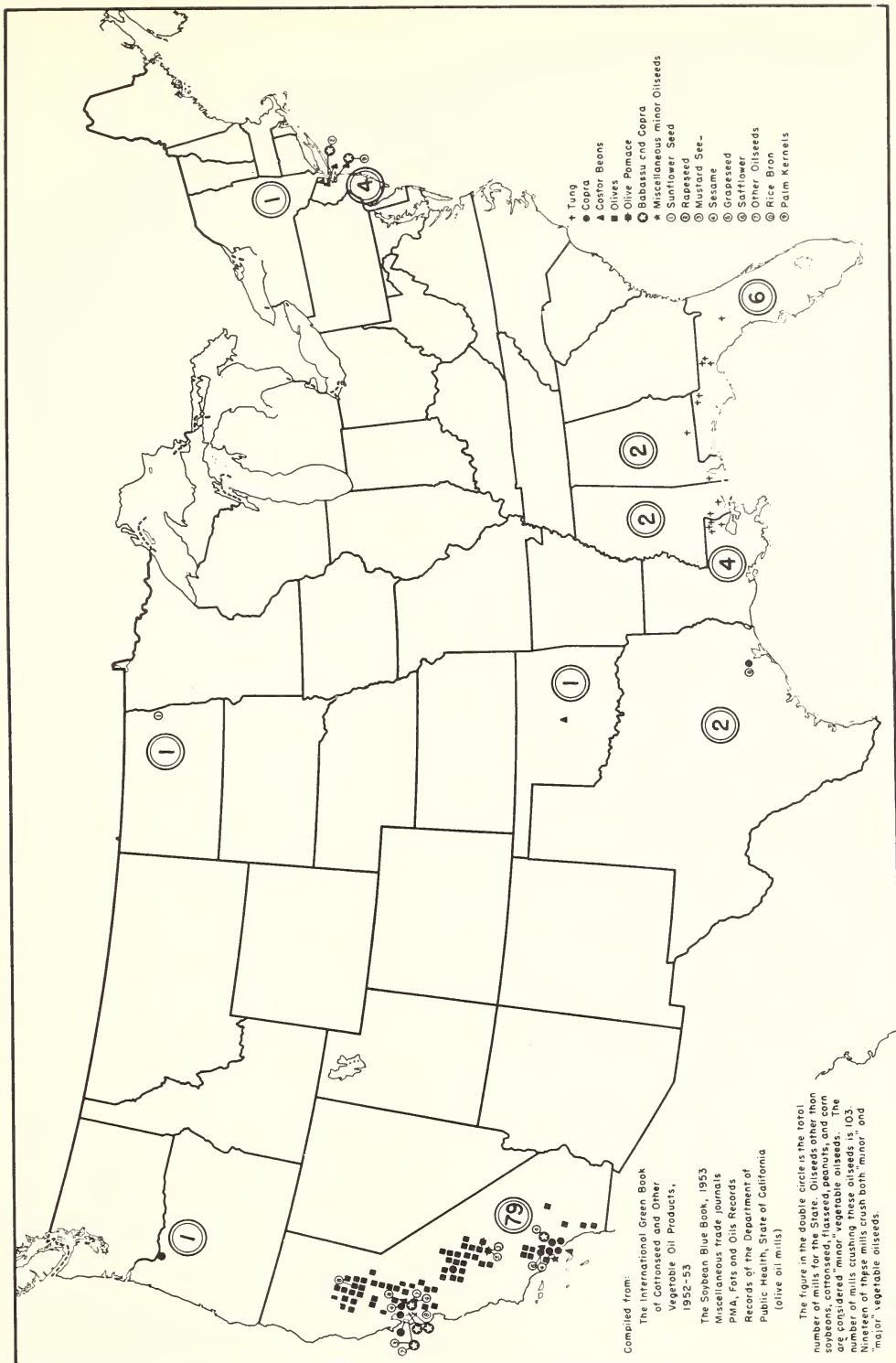


Figure 9.--Location of mills processing minor vegetable oilseeds, 1953









